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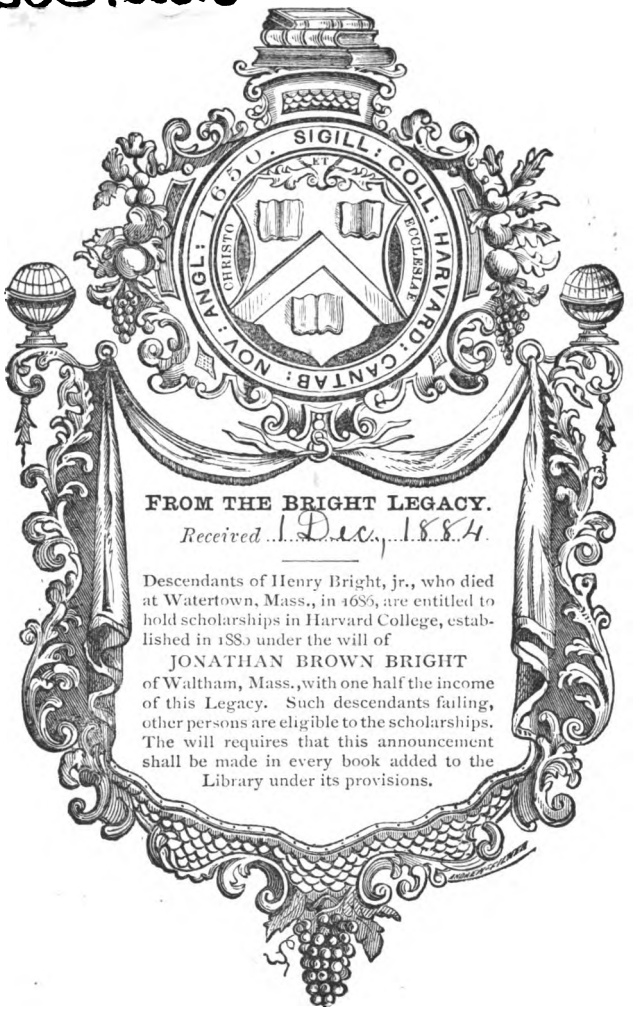

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TRANSACTIONS

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CONTENTS.

	Page
Officers of the Albany Institute, 1875,	v
The Water Supply of Constantinople, by Henry A. Homes,	1
Chief Justice Taney, A Sketch and a Criticism, by Isaac Edwards, Esq.,	19
The Alchemy of Happiness, by Mohammed Ghazzali; translated from the Turkish, by H. A. Homes,	38
Report of the Second Class in the Second Department, Botany, by Charles H. Peck, Chairman of the Class,	152
The Water Supply of Albany, by Peter Hogan,	167
A new Form of Rotator, by Prof. L. C. Cooley,	179
Detection of Heat by Convection, by Prof. L. C. Cooley,	181
Annual Report of the Class in Philology, Ethnology and Anthropology, by Wm. H. Hale, Ph.D., Chairman of the Class,	183
Supplement to the Calculus of Operations, by John Paterson, A.M.,	191
Notice of Peter Hasenclever, an early Iron Manufacturer, by Henry A. Homes, LL.D.,	199
The Geological Evidence of the Origin of Species by Evolution, by Prof. Charles Callaway,	207

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Mr. Otto Meske's Collection of Lepidoptera, by Mr. J. A. Lintner, - - - - - - - - - - - - 215

Thoughts on Causality; with Rerences to Phases of Recent Science, by Alexander Winchell, LL.D., - - - 221

Portable Boats, by Verplanck Colvin, - - - - - 25

The Mohawk and Hudson River Railroad, by Joel Munsell, 267

The Black Spruce, by Charles H. Peck, A.M., - - - 283

Errata, - - - - - - - - - - - 302

Index, - - - - - - - - - - - 303

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TRANSACTIONS.

The Water Supply of Constantinople. *By* HENRY A. HOMES.

[Read before the Albany Institute, June 4, 1872.]

In eastern countries pure water is ever a theme of popular interest. The numerous "dry and thirsty lands where no water is," and the liability to droughts in more favorable positions, will always make the question of a supply of water of the utmost importance. The simple habits of the people, using no beverage in large quantity but water, render the matter of its abundance and quality, a fertile topic of conversation. The population that now inhabit Asia Minor and European Turkey, emigrating from a more arid country, retain as a hereditary gift an anxiety about, and a love for water, not because they *need* it more or *use* it more than other people, but because they appreciate it with more intense emotions. The records of the Bible are full of references to artificial arrangements for water by wells and cisterns, even for rural or nomadic tribes. The selection of the sites of the great cities of the old world of Asia has been controlled by their easy supply of water, such as Broosa, Cairo and Damascus. But when Constantinople was determined upon as the new capital of the Roman empire, the fact of its position as a place from whence to command two continents predominated over all considerations of an abundance of water. Before giving an account of its supplies of water, allow me to recall to your minds the prominent features of its geography.

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Constantinople is built on the rocky heights of seven hills on the north shore of the sea of Marmora, and just west of where the Bosphorus strait opens into that sea from the Black sea. The distance between the Black sea on the north and the Marmora on the south, is not more than twenty miles, for a distance of thirty miles from the Bosphorus towards the west. The general height of the table-land in the vicinity of Constantinople is about 150 to 200 feet, which is intersected with valleys, where are still, or have been small streams.

Down to the northern shore of the Bosphorus, from the west, comes a spur of the Hæmus or Balkan range of mountains, its water-shed to the north and south being at a distance of five or six miles from the Black sea, and fourteen miles from the city. Nearly all the artificial ponds for the aqueduct water supply of Constantinople are close upon the south side of this range of hills, the highest point of which may be about 770 feet. This region is commonly called the forests of Belgrade, and has acquired a prominence in English literature on account of the letters written from the village of that name by Lady Mary Wortley Montague, while residing there in 1717. A vast quantity of moisture in the form of snow and rain falls in this region during the winter season, which naturally collects in the ravines, in two small streams, that finally becoming one, empty into the harbor of the city, the Golden Horn.

When, in the year 330, Constantine the Great came to Byzantium, and founded New Rome, which the Greeks preferred to call Constantinople, in addition to the one hill of Byzantium, he enclosed six contiguous hills; and recalling the unsurpassed length and grandeur of the aqueducts of old Rome, and stimulated by an ambition full of reminiscences of its magnificence, he commenced immediately on the same imperial scale with all his expenditures,

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to provide water for the crowds that were flocking to this queen city. And the lofty aqueduct which was built by him more than fifteen hundred years since, is still the chief channel for water from Belgrade to the capital.

The well water of the city was then and still is bitter; the water of the two seas was salt; and the only river near by was far too small to afford an adequate quantity. The plan then adopted by his engineers, and the constructions then made, have been retained, with expansions by successive kings and sultans, to the present time.

The course adopted was to make dams across the mouths of the upper valleys, arresting the smallest rill in its progress. From the ponds thus formed, the water was conducted in channels of cylindrical tiles to larger reservoirs formed by larger dams. Those of the lower reservoirs were most solid constructions of marble, eighty and a hundred feet in height. The banks were left in their natural state, the trees growing down to the edges of the lakes.

The people give the name of dam or bendt to the lake formed by the dam; the Persian word bendt being perhaps the same in its etymology as our words *band*, *bind* and *bond*. The water from one set of bendts is conducted by the Crooked aqueduct to the aqueduct of Justinian, and the water from another set of dams which are farther to the west, is conducted by the Long aqueduct, also to the aqueduct of Justinian.

The Crooked aqueduct, so called because it makes a turn or elbow in crossing the valley, is nearly 1,000 feet long, 670 feet on one length and 300 feet on the other. It rests upon three tiers of arches, having a breadth at the base of twenty-one feet, and at the top of eleven. It is a rustic work in fine taste stretching across a valley 600 feet wide. There is an arched passage way through the upper tier of twenty-one arches by which one can cross from one side of

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the valley to the other. The whole height of this aqueduct is 110 feet.

The Long aqueduct has two tiers of arches, fifty in the upper tier, and forty-eight in the lower one. Its whole length is about 2,229 feet, its height 85 feet, and it is twelve feet thick at the top. This aqueduct was built by Suleiman the Magnificent in 1550, as a farther supply for the city. It is supplied with water from bendts in a different direction from those which supply the Crooked aqueduct, but the waters of both proceed in stone channels by the sides of the hills, winding with their curves till they reach and unite in the aqueduct called equally that of Constantine and of Justinian. All these aqueducts have gilded inscriptions in Turkish which speak of their being built or restored by Turkish sultans.

The so-called aqueduct of Justinian, believed by historians to have been built by Constantine, is about twelve miles from the city. It is a very high aqueduct through its whole length, being 112 feet in height. It is 840 feet long, and 15 feet thick at the top. It has four large arches of fifty feet span each at the bottom, four similar arches in the second tier, and between each arch and at the ends, three tiers of smaller arches. A gallery pierces the square columns of the first story, giving a passage through its whole length for promenaders. After leaving Justinian's aqueduct, the water follows the right bank of the river Cydaris on the table land, now crossing a ravine on a single arch, and anon piercing through a hill for a hundred or more feet by a tunnel, till it reaches the elevated plain just outside of the city gates at Daoud Pasha, where it is discharged into a receiving reservoir and thence by pipes of diverse construction, stone, tile or lead, to various parts of the city.

In the early days of Constantinople, an aqueduct, which still remains to constitute a conspicuous object as you gaze from Galata upon the centre of the city, was built by the

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Emperor Valens, which was intended to convey the water of Justinian's aqueduct from the fourth to the third hill of the city. In the year 370, the Emperor Valens, wishing to revenge himself on the city of Chalcedon, just opposite to Constantinople, razed its walls, and took the stones to build this aqueduct. For some unrecorded reason, it has long ceased to be used for the purpose for which it was erected. It rises prominent in the city, dark, hoar and massive, overgrown with blackberry vines, ivy and overhanging bushes, which are ever kept fresh by the water oozing from the stones. A path may be followed on its top extending for the length of a mile. Here you find that pipes are laid, by means of which water crosses its path, the aqueduct being used instead of columns, at various distances for the support of pipes, which constitute a kind of inverted syphon. Of these syphons I will speak more particularly in connection with the next and only remaining aqueduct.

This last aqueduct is of purely Turkish origin, and was built, in the name of the mother of Mustapha III, the *Validè Sultan*, a little more than one hundred years since. It conveys water from the eastern end of the range of hills of Belgrade, to Pera, Galata, and the villages on the Bosphorus. It commences, as do the others, with dams or bendts to form lakes in the valleys. The lower dam of this one is of marble, 400 feet long, sixty feet wide at the bottom, and 130 feet high. The promenade on this structure is protected by a stone balustrade four feet high; the marvellous effect of its size is heightened by buildings two stories high at each end for the use of royal parties. The water soon after leaving the bendt crosses a valley by an aqueduct supported on two tiers of arches, eighty feet high and 400 feet long. A public road passes under it. Its top is covered with marble slabs; the channel is fifteen inches wide and eighteen inches deep; the velocity of the water,

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six feet in a second. It has been calculated to be able to supply 6,000,000 of gallons in twenty-four hours.

In the winding course of the canal towards the south, there are several breaks or alterations of level, said to have been devised for the sake of exposing the water in its fall to contact with the air. Branches go off from it to villages on the Bosphorus; and as it approaches Pera on the hill, its water branches off to four or five villages of which it is the centre, from a receiving reservoir 200 feet square.

No one of the engineers of these aqueducts availed himself of the fact that water would safely run in pipes and channels having curves of rise and fall. They had not a knowledge of the strength of cast iron pipes, and could only use lead, or tiles joined with cement, which might yield to the pressure of the column of water; and this may have been the sufficient reason for their choosing to depend on a uniform descending flow of the water. There was an experiment, however, which they tried in bringing the water of this aqueduct to the city, which has been uniformly noticed by travelers, and the reason for which it is difficult to understand, nor have I ever known it to be satisfactorily explained. When the water canal reached the edge of a valley which it must necessarily cross, it was allowed to descend the hill to the foot of a stone column thirty to seventy feet high according to circumstances; then a pipe of lead conveyed it to the top of the column into a small open basin; from this basin it overflowed into a second pipe likewise open at the top, and descending passed under ground some hundred feet to a second column of the same height, where the same process was repeated; and so on till the top of the opposite hill or rise of ground was reached.

As we know that the water could in no case rise higher than the level of the last column from which the water had flowed, the question arises what advantage did the engineers expect to gain by the contrivance? Did they be-

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lieve that their pipes would not burst in the circumstances in which they had disposed them, but would burst if carried continuously down and across the valley? Or did they think that they could raise the water higher than they otherwise could at the delivery end of the aqueduct?

The name they themselves gave to these columns was *sou-terazou*, or water balance, which may be a clue to their theory. Andréossi observes respecting them: "It requires but little attention to perceive that this system of conducting tubes is nothing but a series of syphons open at their upper part and communicating with each other. The expense of a conduit by water balances is estimated at only one-fifth of an aqueduct with arcades." George Buchanan, civil engineer, thinks that Andréossi has misconceived the nature of this device.

These are all the artificial means of bringing water to the city from without, except what is reported to be brought from certain springs five or six miles to the west, from Kavasskieui and Chalcali. But from the little that has ever been said regarding them, I am confident that the number of persons supplied from thence must be very few.

At the present time the government is engaged upon a new scheme for an additional supply, the deficiency being felt in proportion as the population increases. The stream which empties into the harbor, is to be dammed up, and from the surface of the pond created, the water is to be raised by steam power, one hundred feet, and conducted to the city by pipes.

We now leave the aqueducts and come to the distribution of the water in the cities and villages. It is distributed into covered cisterns, to the public fountains, and to the mosques and khans; but not to private houses, with few exceptions.

Of cisterns and basins, in the time of the Greek Empire, there were nineteen large ones established in the elevated

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parts of the city. But owing to the carelessness of the Turks, and possibly to different notions of the best method of disposing of the water, they may be said to be all of them either in ruins or not used for the purpose for which they were created. The location of them all is now known, and can be pointed out. Some of them have been unroofed (if they were ever covered), and converted into vegetable gardens, or filled with houses; in one is a mosque. Into others one can grope, as into the subterranean regions of a palace in ruins. The most famous of these cisterns is the *Bin bir direk*, or Thousand and One Columns, which is still complete in its outline. You descend from the street, to the bottom of it, about fifty feet, and find a few score of people, squalid and unhealthy, availing themselves of the humidity of the atmosphere, to pursue their profession of twisting silk. Its vaulted roof is supported by 224 marble columns, symmetrically arranged, about twenty feet apart, and seventy feet high; one-third of their height being buried in accumulations of earth. Grated openings have been made in angles at the top to furnish a dim light. At three points near the top may be seen channels worn where the water formerly ran in. It has been estimated to cover an area of 20,000 square feet, and that it would have contained 1,238,000 cubic feet of water, and would alone have sufficed for the consumption of the city for fifteen days. The pillars bear occasionally an inscription in Greek, *Euge Philoxene:* Hail! stranger's friend!

Another cistern, the knowledge of which has been gained and lost several times since the Mohammedan conquest, is called the *Yéré Batan Serai*, or the sunken or engulfed palace, such is its vastness and the mystery with which the perhaps fabulous reports of its extent cause it to be regarded. It is in the neighborhood of the Mosque of St. Sophia, and was built by Constantine. It has also a vaulted roof, and is supported, as far as examined, by 336 granite

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columns, each of a single block, with Corinthian capitals, and fifteen feet apart; the length of it is marked by rows of sixteen columns, and its width by rows of twenty-eight, being about 275 feet wide by 475 feet long. The cistern usually appears to the traveler, with the columns hidden to two-thirds of their height in water, but that portion of them which is visible is covered with sculptured ornamentation. The spot from which you gaze over its waters is not a regularly constructed opening, nor is it known where there is one; this has been made by the failure of some of the pillars to sustain the superincumbent mass. The roof has failed in several other directions, not visible from the place where you look in. It is not known who or how many have the means of obtaining water from this cistern. Boats have at times been in use for the curious traveler, and an Englishman is said on one occasion to have followed a canal from the cistern in a boat for two hours in a right line, and returned without reaching a termination.

One quite perfect but empty cistern is the Budrum. It is not as large as some of the others, but is very beautiful in its architecture. Its columns are three times the circumference of those in other cisterns, each of a single block. It is also occupied by silk spinners, like that of the Thousand and One Columns.

The original solidity, the number, the capacity for holding water, and even the architectural beauty of these cisterns, render them a most remarkable branch of the earliest Constantinople water system. They were designed as cisterns of reserve, either to enable the city to stand a protracted siege, or to respond to the necessities of the population, when in consequence of drought or accident the water in the reservoirs outside should be exhausted. But the conquerors of the infidels never believed in a coming time when they should be besieged, and their under-

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takings in architecture were almost entirely religious or commercial. Although they have suffered these cisterns to be disused or ruined, they might some of them be converted to their original purpose. The ground on which the houses stand has been gradually raised by the debris of four centuries, and in digging for the foundations of modern edifices, accidents occasionally reveal crushed cisterns of greater or less extent.

The large use of the public water for public fountains appears to be the Turkish substitute for the public cistern. The word fountain as employed in Turkey never suggests the mere use of water in an ornamental *jet d'eau*. It refers to the place where the water carrier or the people may go, and by means of a faucet draw water for themselves, immediately closing the faucet. The structure over and around the pipes may be the most costly, of the richest stones and covered with gilding, so that one is astonished at its elaborateness and magnificence, yet no water is freely flowing, except when some one is waiting with a vessel to be filled. The fountain is but a public pump.

Some of the fountains, especially in the Christian quarters, are as plain as it is possible for stonework to be made. In the Mohammedan quarters they are very numerous, because there is no pious work in which a rich man so readily engages as the construction of a fountain, which bears his name inscribed in poetical lines, for the benefit of the people of his quarter, although the water is drawn from the public aqueducts.

The water-carriers are under the control of the water superintendent, and receive a fixed and moderate price for each skin of water which they empty at your house. Twenty years since it was not more than a penny, or a penny and a half according to the distance for the ten gallons of water the skin would hold; the water itself is public and free without tax of any kind. In my own house

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this water used to be emptied into a large mouthed earthen jar, as large as those in which the Forty Thieves hid themselves. They are sometimes made as large as a hogshead.

The water is frequently discolored after rains with the light loam of the fields; but I never knew it to have a disagreeable odor or taste derived from microscopic plants.

The whole direction of the bendts or lake reservoirs, aqueducts and fountains is under an officer of high rank who has three to four hundred Turks and Christians constantly employed under him. The pipes, as large as three inches in diameter, are of lead, cemented at the joints with hemp and a glutinous mixture. Some have attempted to calculate the cost of the various public water works and have estimated it as high as $50,000,000.

Thus much as regards the public provision of water. But the record of their experience has long since taught people of all classes and especially the more provident Christian races, not to rely on the aqueducts alone.

In all the mosques, churches, khans, and in most of the private houses, there are both wells and cisterns. The water of the wells is obtained without digging to great depths, twelve to thirty feet, but it is invariably disagreeably bitter. It is thoughtfully used for gardens, for cleaning the house and laundry purposes; but never for drinking or cooking.

In constructing a cistern, it is built of stone or brick, well cemented, and of the greatest possible size that the ground of the edifice or house will allow. The cisterns receive all the water they can possibly collect from rain during six months of the year, and the master of the house carefully keeps the key that the water may not be wasted before the dry season arrives. The surface of the roofs is large in proportion to the number of houses, because the houses are usually not more than two stories high. The water of the first rains of autumn is carefully turned off from the

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cistern for the sake of maintaining its purity. In consequence of this and the absence of coal smoke the water is remarkably pure.

When the American Robert College was building last year at Constantinople, under Dr. Hamlin's supervision, his first care was to have a large cistern dug in its central court, the building being more than 100 feet square. He both saves the water of the roofs, and obtains the privilege in winter of filling it from the aqueducts. It is large enough and receives water enough for a three- months supply and with some to spare, for a family of two hundred and fifty persons, through the period when there might not have been a drop of rain. A well in addition has been dug upon the premises, from which water may always be obtained by means of a horse pump.

In the vegetable gardens, water is drawn from wells which are from 50 to 75 feet deep, and 20 feet diameter at the bottom, by means of large water wheels with buckets, which are turned by a horse, and occasionally one may see the old fashioned well-sweep.

In addition to the supply for houses from the aqueducts, there is an arrangement for most of the larger houses in the villages on the banks of the Bosphorus, which has not been noticed by any travelers. The shores of the Bosphorus rise more or less precipitously to the hight of a hundred feet or more, and then the land stretches out in a plain. The owners of houses owning lands up the hills tunnel the rocky ledges a distance of from fifty to one hundred and fifty feet, and construct receiving reservoirs in the rock on the sides of the hills, and conducting the water by means of cylindrical tiles down the hill from one reservoir to another, they obtain usually from the percolation of the water through the slaty sandstone, or the flow from the hollows in the plains above an abundant supply for the year, available on every story of their houses.

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There is a fountain on the Asiatic side of the Bosphorus at Beikos, which is day and night pouring out four inch streams of water, from several brass pipes. This water filled into barrels is floated down the current in barges for the wants of all the shipping and the Imperial fleet. In fact, if Constantinople were only attacked by land, the supply of water from this and other magnificent and inexhaustible springs on the eastern side of the Bosphorus would be abundant for its wants.

The facts already mentioned give a general view of the nature of the arrangements of the water supply for Constantinople. There are still some additional observations worthy to be made, if they have not already suggested themselves to your minds.

1. The catchment basins receive water from only a very limited surface. As it can be traced upon the map, it extends to a very small number of square miles.

2. The sides of the hills are all covered with forests of oak and chestnut, and also far beyond the spots whence any water could flow to the reservoirs. This devoting so large a space to forest wildness within ten miles of a million of inhabitants is no mystery to the people. It is the result of a custom, and a stringent law enforced for 1,500 years, and not a new discovery. The edicts of the Greek emperors were very early issued requiring the planting of trees and forbidding any person other than the authorities to cut down a single tree, and the Turks enforce the same law. There *may* be, there *are* differences of opinion as to the physical laws by which the perpetuation of forests secures rain and preserves moisture, but there is no difference as to the *fact* that with the devastation of the forest on the hill-side, the usual and regular flow of water is greatly diminished. The subject is discussed in more than 200 pages in Marsh's *Man and Nature*, in which is a compilation from many authors on the influence of denudation on the

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land as regards moisture, and of the conflicting influences which operate. No record exists of the destruction of these forests on any occasion except once in 1823, when the Janissaries were destroyed by Sultan Mahmoud. It was a question of life or death, and to drive the remmant of them out of these forests, they were set on fire; and miles of trees, hundreds of years old, were consumed, and the fleeing Janissaries were shot.

Other edicts prohibited under severe penalties the diverting of any portion of the water by any individual, and as is extravagantly reported, requiring a pound of gold for each ounce of water stolen.

3. The quantity of water furnished by these aqueducts is very small when compared with that furnished for the modern cities of Europe and America. Andréossi, formerly French ambassador in 1814, the most exact of all who have written upon the subject, estimated that the quantity supplied for each man, woman and child from all the aqueducts was 400,000 cubic feet a day, which is equal to 3,200,000 gallons; and on the supposition that the city proper contains 600,000 inhabitants, is only two-thirds of a foot or five gallons a day to each person. We know that in many of our cities the draft from the aqueducts ranges from forty to ninety gallons for each person. Dr. De Kay's calculation, one of less exactness, was that 15,000,000 gallons were supplied each day.

4. Water is only provided for domestic purposes and drinking, and religious ablutions. It is not provided for steam engines or breweries. There are no hydrants. The fire engines, carried on the shoulders of four men, squirt the water poured into them only from the skins of water-carriers, in case of a fire. They will hold about a barrel. The water of the Albany aqueduct is used by 144 steam engines, 36 breweries and malt-houses, 313 street hose, and for other similar purposes.

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5. The Constantinopolitans by no means make as lavish a use of water as is frequently represented by travelers. Of course the amount that would be brought to any family by a water carrier and paid for, must be very small when compared with the quantity used where it runs freely in a house from several and many faucets. And they do not use nearly as much in baths or in religious ablutions as would be supposed. While it is true that in every quarter there are public baths which are greatly used, and private baths of the same kind are not unfrequent, yet it must be remembered that they are only hot vapor baths. The inner room is occasionally highly heated and the air kept moist by the evaporation of water at times thrown upon the hot floor and walls, to make the heat agreeable and endurable. One room serves for all the customers. After an abundant perspiration, the person goes to a marble bowl and is washed or washes himself in warm water. But the quantity of water employed by any person taking a cold or warm bath by immersion is probably three or four times as great as would be used by a customer in a public bath in Turkey, Besides, the baths are not used by the public generally during more than eight hours in a day.

In the case of ablutions before prayer five times a day. it is purely ceremonial and very little water serves the purpose. In the courts of the Grand mosques fifty faucets in a row give out when opened a tiny thread of water, and the intending worshipper, crouching before it, touches his ears, arms and ankles with the fluid, not perhaps consuming more than half a pint.

6. A famine of water is not unfrequently experienced in Constantinople; a want of water is constantly feared. This is in great measure owing to the neglect and disuse of the public cisterns which were expressly designed to receive the overplus of the water from the winter rains. In the summer and autumn months it is not unusual that three, four

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or five months pass without any fall of rain that can be collected. At such times of course water is sold at high prices by those who have cisterns or who bring it from the perennial springs of the Asiatic Bosphorus.

When water runs low in the reservoirs, nine out of ten of the public fountains will be closed by the water superintendent; those left open will be surrounded by the public water carriers, who almost monopolize the one faucet from which the small stream can be drawn, while a crowd of men and women press clamorously for a turn to draw it into their own private vessels.

At such times of drought, notwithstanding the interpretations usually given to the doctrines of the Mohammedans, as if they were absolute fatalists, an interpretation we have given on account chiefly of their former fatuity in the matter of submission to the plague, yet when a drought becomes serious the monarchs have issued proclamations calling upon the faithful to assemble and pray for rain. And they have been assembled in consequence by tens of thousands on the open plains around the city, including all the children of the public schools, and there invoked the God of heaven to send rain.

On the summit of the Giant's mountain on the east shore of the Bosphorus there is a convent of dervishes, where in such times of drought a dervish watches the approaching answer to prayer, looking across the waters of the Black sea to the north, to see the first rising of the cloud big with rain. And his report is quickly heralded to the anxious citizens.

In illustration of the remarks with which I commenced, I must again allude to the admiration and love of the people for pure, sweet water. If it is not the sole beverage, still, its place is not supplanted by mingling it with spirituous liquors, nor by using tea or coffee as a substitute for it. Tea is drunk by not one in a thousand, and coffee, from

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cups holding much less than a gill, and spirituous liquors, by the few that use them, are swallowed without adding any water.

All the fountains are supplied with cups; at the mosques, water may frequently be found ready poured out in long rows of cups for each passer-by to take what he needs, without pay; this provision being made in consequence of the pious legacy of some individual.

In the business streets, there are shops devoted principally to the sale of water, by the keg, or by the glass, at one-tenth of a penny for a glass, the water being brought in such cases from well-known and favorite springs, from ten or fifteen miles distant.

I once spent a few days at Alem Dagh, or "mountain of the world," a village twelve miles from the city, near the hill of that name. From the foot of the hill, in different ravines, burst out small springs of water, each of great purity, but with a slightly differing taste. The citizens passing the summer there, in the morning or evening, give their orders regarding the water to be brought to them. And thus one would say, bring me water from Silver spring, another, bring me from Apple spring, and another, from Diamond spring, and so on. And when the waters were brought, each one could distinguish the taste of his favorite water, from that of each of the other springs.

Pic-nics and summer excursions are all devised primarily to visit a fountain or spring in the country, rather than to visit a grove or a hill.

I will close with only one or two remarks suggested by our circumstances in Albany. Having in mind the various schemes for a fuller supply of water proposed by the worthy Water Commissioners, the question presents itself, whether something might not be accomplished by maintaining the water shed of our reservoirs carefully covered with a forest,

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and thus protect the soil from the influence of the sun and winds, and insure the regularity and permanence of the flow. These forests at the same time might aid in protecting the vicinity of the city from the spread of the dunes or sands. And, lastly, the restriction of the use of public water to the amount specifically paid for, being only a question of time, all are interested to provide for the different uses of city life, such an amount of water as can be obtained from wells and cisterns on their own premises. Others also might be maintained at the public expense.

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Chief Justice Taney—A Sketch and a Criticism.

By Isaac Edwards, Esq.

[Read before the Albany Institute, January 7, 1873.]

The recent publication of a memoir of Chief Justice Taney, naturally attracts attention. I do not propose a review of that work. My purpose is rather to draw attention to the true features and characteristics of a distinguished man, in a candid and truth loving spirit.

There are some characters, in history, apparently condemned by destiny to fight in a lost cause. The stars in their courses fight against them. The Emperor Julian, nicknamed the apostate (and rechristened the apostle by an erudite Lord Chief Justice of England), is a conspicuous representative of the ill-starred company; a unique figure in history, with genius and virtues that qualify him to shine as the ruler of an empire, he stands condemned and stained by an epithet of infamy, because he strove to restore the fading glories of pagan Rome, and entered into controversy with a new and subtle power, which had the promise of the future, and was already growing into the empire of mind. He could conquer the open enemies of Rome, but he could not extinguish the Christian faith. With all his power and enthusiasm for the old pagan faith, he could not bring back the worship of Jupiter and Minerva. All that battle, therefore, with infinite skill and pious fraud and smoking altars, was delivered in a lost cause.

Roger Brooke Taney, was born on the 17th of March, 1777, in Calvert county, Maryland. He was the third child and second son in a family of seven children. His ances-

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tors were among the early emigrants to that state; Roman Catholics seeking refuge from the severe penal laws of England. His father, Michael Taney, was educated in the Jesuits' college at St. Omers; he returned home and was married to Monica Brooke, daughter of a neighboring planter or farmer, a little while before the commencement of the American Revolution. The Brookes were an English family, of the same faith, and among the early emigrants to the Catholic colony of Lord Baltimore; they appear to have settled first on the banks of the Patuxent, and were a family of a large estate in lands. The mother of the future chief justice was a very pious woman, of excellent judgment, and great gentleness. Her influence upon the character of her son, appears to have been deep and lasting; it shows itself long afterwards, in the wish expressed by him, that he might at last be buried by her side near the little Catholic Church in Frederick city.

His father owned a good landed estate, and slaves. Though not rich, his property was sufficient to enable him to live comfortably and educate his children. He loved the amusements of the country, and he was fond of fox hunting; a sport in which the circumstances of the country enabled him to indulge with great freedom.

The son was prepared for college, mainly, by the aid of private tutors; he entered Dickinson college at Carlisle, in Pennsylvania, in 1792, a little more than fifteen years of age, and graduated three years after. He returned home but twice during his college course, walking on both occasions from Carlisle to Baltimore, about eighty miles. From his own account of his college life, his studies were prosecuted with reasonable diligence. Dr. Nesbit, the president of the college, a Scotch Presbyterian, appears to have been a favorite with the class; under him our student was trained in Ethics, Logic, Metaphysics and Criticism. He was a close student, of an active habit, and, as

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he tells us, read much not prescribed in the college course. His standing in college may be inferred from the fact that, though much younger than many in his class, he was elected to the second honor, in a class of about twenty-five.

The winter after he left college was spent at home, chiefly in the amusement of hunting. In the spring it was necessary for him to enter upon a new course of life. It was his father's plan to give his landed estate to the eldest son, and throw the rest of his children upon their own resources; thus working out in his own family the good and evil flowing from the English law of primogeniture.

In the spring, after an idle winter, he commenced the study of law at Annapolis, in the office of Jeremiah Townley Chace, then one of the judges of the General Court of Maryland, a court of general jurisdiction, which held four sessions a year for the trial of causes; two at Annapolis with a jury summoned from the western shore, and two at Easton, with a jury summoned from the eastern shore. Annapolis, being the chief centre of population and commerce, was naturally the place where the most important litigation was carried on, and where eminent lawyers and judges either resided or attended court. It was therefore considered the place of all others in the state where a man should study law. His mode of study here is noteworthy. It is an admonition worth remembering. He says himself: "I associated only with the students, and studied closely. I have, for weeks together, read law twelve hours in the twenty-four. But I am convinced that this was mistaken diligence, and that I should have profited more, if I had read law four or five hours, and spent some more hours in thinking it over, and considering the principles it established, and the cases to which it might be applied." With an ordinary man the mode of reading pursued by him, ends in a dismal swamp, in much vague knowledge, without any clear apprehension of principles.

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On the other hand, following the plan he recommends, and studying the law distributively, in its application to subjects and transactions as they arise in the ordinary course of life, as a system of principles founded in reason and justice and public policy, even an ordinary man may get on with some success. The question is interesting. How can a man grasp and appropriate the reason and spirit of the law? A verbal answer may be easily given: it can be done by drawing largely upon the fountains of the law, by deep insight into the nature and wants of man, as an individual and as a member of society; and by an earnest inquisition into the intent and purpose of the law. It can be done as Kent did it, and Marshall and Mansfield; it requires experience, the wisdom of practical knowledge; it is gained through all the powers of the mind, preëminently through the moral sense.

Mr. Taney was admitted to practice in the spring of 1799, after a clerkship of three years. He was now twenty-two years of age, ambitious of distinction, full of courage and high hopes. He had witnessed the professional efforts of many distinguished lawyers, Luther Martin, William Pinkney and several others, who held almost equal rank with them, and he aspired to a like eminence. And yet we find him, on his own confession, so oppressed with a species of morbid sensibility that he could not rise to address a jury or an audience with calmness and self possession. This quality, this susceptibility to the influences that converge upon the advocate in his highest efforts at the bar, is worthy of note; he was never able to conquer it. Every address, every argument cost him an effort of his firm and resolute will.

He was tall and slender, and his health was infirm from his earliest years; in his later years, his frame became very much attenuated.

Soon after his admission to the bar, he was chosen from

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Calvert county, a member of the House of Delegates, the popular branch in the legislature of Maryland. He was elected as a federalist, and served with credit in the session commencing in November, 1799. He was a candidate for re-election the next year, and failed on account of the decisive change then occurring in the politics of the state. This defeat was probably one of the most fortunate events in the course of his life. He now betook himself to the practice of the law; choosing Frederick city as the field of his labors, because it seemed to offer better opportunities to a young man than a larger city like Baltimore. His choice was a wise one; it gave him a pleasant home in a beautiful valley, in the midst of a prosperous community; it gave him opportunities for study and a fair share of business; it brought him into close and intimate relations with the whole body of the people; and this in turn gave to him the strength which every wise-hearted man derives from the consciousness that he is working in his measure for the common welfare. He was not indifferent to his own interests; but diligent and studious. After a practice here of about five years, like a sensible man as he was, he married him a wife, Anne Phebe Charlton Key, a sister of the author of the "Star Spangled Banner," of a family residing in the immediate neighborhood on a plantation, owning slaves, without forgetting the nature of the African or his interests. Let me say here, lest I forget it, that Mr. Taney inherited slaves as property, and *manumitted them.* This marriage was a happy one; it was cemented by a genuine affection to the end of life, and it was embellished through more than forty years by a beautiful courtesy, in spite of the fact that the husband was a devoted catholic, and the wife a devout protestant.

Mr. Taney rose steadily in his profession, and was employed in many important causes. He acted as counsel for Gen. Wilkinson, tried before a military court at Freder-

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ick, in 1811; the General being, at the time, under a cloud in consequence of the part he played in connection with Aaron Burr. The charges were not sustained, and his sword was restored to the accused, rather against the public judgment. Some time after this (in March, 1819), we find him engaged in the defence of Martin Gruber, a Methodist minister from Pennsylvania, indicted for attempting to incite an insurrection among the slaves. In the course of his sermon this minister had used these words: "But are there not slaves in our country? Do not sweat and blood and tears say there are? The voice of my brother's blood crieth; is it not a reproach to a man to hold articles of liberty and independence in one hand and a bloody whip in the other, while a negro stands and trembles before him, with his back cut and bleeding?"

"We Pennsylvanians think it strange, and it seems curious to read the prints or newspapers from some states and find — *For sale, a plantation, a house and lot, horses, cows, sheep and hogs; also a number of negroes,— men, women and children, some very valuable ones; also a pew in such and such a church.* In this inhuman traffic and cruel trade, the most tender ties are torn asunder, the nearest connections broken."

The counsel's conduct of the defence was manly and noble. He did not attempt to take back the words of his client; he could not do that; for they had been bravely spoken, in the open light of day, to a large and mixed audience; he therefore justified them, before a jury of slaveholders. He maintained the right of his client to entertain and to express his convictions freely, on all moral and religious questions; he went further, he more than justified the words charged in the indictment. He spoke "with abhorrence of those reptiles who live by trading in human flesh, and enrich themselves by tearing the husband from the wife, the infant from the bosom of the

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mother." "A hard necessity," said he, "compels us to endure the evil of slavery for a time. It was imposed upon us by another nation while we were yet in a state of colonial vassalage. It cannot be easily or suddenly removed, yet, while it continues, it is a blot on our national character; and every real lover of freedom confidently hopes that it will be effectually, though it must be gradually, wiped away, and earnestly looks for the means by which this necessary object may be best attained." The jury after being out only a few minutes, returned with a verdict of *not guilty*. A report of the trial was at once published, with a letter from Mr. Gruber, in which he says: "I hope while I keep my senses I shall consider *involuntary, perpetual slavery*, miserable injustice; a system of robbery and theft."

Mr. Taney stood high in the public estimation; he was a popular man, trusted and confided in by the people. The purity of his life, and the integrity with which he discharged his duties as a citizen, and as a lawyer, were never called in question. He was regarded as a true representative or leader of opinion; he was twice put in nomination as the candidate of the federal party during his residence at Frederick; once for the house of delegates, and once for congress. Though defeated on both occasions, his allegiance to his party remained unchanged; he stood by his opinions in the day of adversity like an honest man. He remained a federalist until the war of 1812 had gone on for some time; and until the leaders of that party in the eastern states had, by opposing the war *during its progress*, begun to cripple the government. The attack upon Washington and Fort Henry had aroused deep feeling in that part of the country. His party began to divide; some opposing the war utterly, as in the beginning, and some supporting the government in its prosecution.

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Naturally and justly, as we think, he held it to be the duty of the citizen to support the country against the enemy, without stopping to discuss the wisdom of the acts leading to the war. He interpreted his duty correctly in the light of public law; for by that law as declared by the highest court of our state, in the days of Kent and Spencer, every man is a party to the acts of his government. This may appear theoretical; it certainly raises a question of morals, precisely the same question as that raised by Decatur's famous toast,—"*My country, right or wrong.*" The opposite view, my country only when it is right according to my theory, leads to anarchy and national humiliation; it denies the unity of the Republic, and it repudiates the just authority of government.

Just at the close of the war, (in 1816), Mr. Taney was elected by common consent a member of the senate of Maryland; and served out his term of five years with great advantage to the state, and apparently with much satisfaction to himself. His biographer tells us, he was not fond of public life, and did not much value or seek after political honors. Without this assurance and judging solely from the facts of his life, we should have inferred exactly the contrary. Nevertheless, we must admit that these facts are consistent with a higher love for his profession, and that he rose steadily to the highest position at the bar in his native state. He had become a supporter of General Jackson for the presidency, and he was in 1827 appointed attorney general of Maryland. This appointment was made by Gov. Kent, a warm supporter of the administration of Mr. Adams; it conferred upon him considerable power and influence; and it imposed upon him a heavy burden of hard work, work which he performed with ability and unflagging industry.

When the cabinet of Gen. Jackson broke up, in 1831, some two years after his inauguration and under rather

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singular circumstances and influences, Mr. Taney was appointed attorney general of the United States, and thus came into association and friendly relations with one of the most remarkable men ever chosen to the presidency. Without going into particulars, it is clear that his appointment was suggested and brought about through the influence of his friends; and that he afterwards won the confidence of Jackson. Martin Van Buren did the same thing. And yet these two men, of about equal powers and with some points of resemblance, were utterly unlike each other in the real substratum of character, and they were both utterly unlike the old hero of New Orleans, whose inflexible will appears everywhere as the chief element, the main strength of his nature.

Every one knows the steps of Taney's advancement; how President Jackson waged war on the United States bank; how the bank used its means, its peculiar weapons of offence without scruple or conscience; how the president resolved on the removal of the United States deposits to the state banks; how his secretary of the treasury, William J. Duane, refused to make the order to that effect; how Jackson removed him at once and appointed Taney in his stead; how the latter immediately made the order, appointing certain state banks as the depositories of the public funds; how this act was justified in the president's message to congress, and criticised by that body; how the appointment of the new secretary of the treasury was sent to the senate for confirmation, and instantly rejected by that body; and how Mr. Taney thereupon resigned the office and went home to Baltimore, a political martyr, as Mr. Van Buren came home from England.

Early in 1835, a vacancy happening on the bench of the United States Supreme Court, the president at once nominated Mr. Taney for the place, and the nomination was "indefinitely postponed." The war of parties went on; the

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great Chief Justice MARSHALL died in the summer, and the president, in December, nominated Roger B. Taney to fill his place. The majority in the senate had passed over to the side of the administration, and in March, 1836, the nomination was confirmed. The boy that had walked home from college, eighty miles in two days, was now chief justice of the United States.

We have had a good many presidents; only a few chief justices. JOHN JAY, an honored name in the history of New York, held the office till 1794, when he was sent minister to England.

JOHN RUTLEDGE, of South Carolina, was then appointed, and held the office one term; his appointment was not confirmed.

OLIVER ELLSWORTH, of Connecticut, succeeded, and held the office till '99, when he was sent minister to France, as Jay had been sent to England. In January, 1801, JOHN MARSHALL, of Virginia, was nominated to the office, and unanimously confirmed. It is worthy of notice that these four men were federalists, that they were not men of extreme opinions, but men of large experience and great natural capacity. The fifth in the line was educated in the same school of politics. Not until the great rebellion had been well nigh conquered, not until 1864, was that high office filled by a man, Salmon P. Chase, educated in the political faith of Thomas Jefferson.

For many years Chief Justice Taney administered the law, and discharged the duties of his office, with great satisfaction to the country. It was thought by some that he showed a leaning towards the doctrine of State Rights, a tendency to limit the powers of the general government to the strict letter of the constitution. He certainly showed no disposition to enlarge the jurisdiction of that great court over which he presided; an excellent virtue this, in the judge of a court constituted like that; the more ex-

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cellent because it involves a voluntary restraint upon the natural ambition and love of power incident to men and courts in all ages, and because a love of power indulged in this branch of the government must work harm in the action of the others, and so destroy the equilibrium of the whole. To appreciate the obligations of his office, a judge of this court must be a statesman, he must comprehend the relation in which the states stand to each other, and to the Union; and he must also, in the administration of justice between man and man, mingle or interpret the rules of law with good sense and sound reason.

I shall not dwell upon, or even enumerate the important public questions that came before the court while Judge Taney held a seat upon the bench. They were met as they arose, with candor and fairness.

But there is one novel case, of no sort of public interest, tried before him at the circuit in Baltimore, which I must mention. It involved a question of copyright. Reed of Boston had copy-righted the air to the song known as the *Old Arm Chair;* and as the piece was popular, Carusi of Baltimore adapted the words to a similar air, and was selling the song in this, its new form; and the action was brought by Reed for an infringement of his copyright. The question for trial was one of fact; viz. whether the defendant's new air was really a new and original composition, or a mere evasive imitation of the old one? It was a question relating to the fine art of music, and it could only be determined by experts. So witness after witness was called on the question, and their testimony, like that of their fellows everywhere, was not very harmonious; finally the plaintiff's counsel proposed that Mr. John Cole, a professional singer, should be sworn and required to sing the two songs to the jury, so that they might judge whether the two airs were similar or not. After a long debate the

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motion was agreed to by the court, and Mr. Cole under oath proceeded to sing to the judge and jury:

> "I love it, I love it, and who shall dare
> To chide me for loving that old arm chair!"

After hearing both songs, the jury, solid men of Baltimore, were unable to distinguish between the two, and therefore gave their verdict for the plaintiff. We see no fault to find with the ruling; the plaintiff was only allowed to read the two compositions to the jury, and surely it was their business to decide on this question of fact.

The chief justice possessed many elements of greatness; a mind of singular grasp and subtle discrimination. He had been distinguished at the bar for his rare capacity as a special pleader. He was equally distinguished on the bench for his readiness and facility, in dealing with questions of form and practice, presented in cases coming up from so many different states. His intelligence and intellectual activity were of a high order; and he was a wise man, after his type of character. He was a good presiding officer; his opinions were well considered, and written in the clear judicial style, becoming a high court of justice. He was a man of pure life, the desires and pursuits of his mind were not corrupted by that reasonable alloy of ambition which entered into the pure gold of his character. Through all the earlier years of his administration, he bore himself calmly in his high office, with dignity and discretion. He had gained the confidence of the country; he was respected and trusted as a capable and worthy administrator of justice and law.

Without much personal or affirmative power, he possessed the influence accruing to him from his high position, and an immense power as a check on the action of congress. It may be that, as he advanced in years, his pride was flattered by the unassailable position he held, and by

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the exercise of such high prerogatives. One does not like to assert an ungracious thing; but we must all admit that, had this been the truth, it would have been only natural.

It was his fortune to come upon a great duty, in the ordinary course of judicial administration. Oddly enough it came in the form of a civil suit for an assault. The action was brought in the United States Circuit Court by Dred Scott, a resident of Missouri, against John F. A. Sandford of New York, for the act of arresting and imprisoning the plaintiff and his wife, and their two children, Eliza and Lizzie, one of them seven, and the other fourteen years of age. The defendant interposed a plea to the jurisdiction of the court, on the ground that Scott was not a citizen of Missouri, but a negro whose ancestors were brought into the country and sold as slaves. Scott admitted the facts alleged against his ancestors, by a demurrer; and the court held that these facts were not sufficient to call for a dismissal of the suit. The defendant then pleaded to the merits of the action, and averred that Scott and his family were his slaves, his lawful property.

The answer of Scott presented his claim to freedom on these grounds; that in 1834, he was the slave of Dr. Emerson a surgeon in the army, and was taken by him first to the military post of Rock Island in Illinois, a free state, and from there to Fort Snelling on the west bank of the Mississippi river, in the territory of upper Louisiana, north of thirty-six degrees and thirty minutes of north latitude; where he remained two years, and where he was married to his wife who had also been taken there as the slave of a major in the army; their oldest child being born on the river, north of Missouri, and the younger after they were brought back into the state of Missouri. On these facts a verdict was rendered affirming the defendant's right to Scott and family, as his slaves.

This was the celebrated case that came up before the

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Supreme Court at Washington for review. A cause more important in its bearings or more simple in form, never came up for decision before this august tribunal. The real parties plaintiff, were four million strong, and the real defendants numbered about sixty thousand. On the side of the plaintiffs, was the silent divine sense of justice; on that of the defendants there was law, capable of being wielded either in favor of freedom or slavery.

The indictment and trial of the seven bishops played an important part in English history; the recoil against the government, created by the verdict of the jury, developed an opinion, born of mingled reason and passion, which at length drove James the Second from the throne. It was a government prosecution, and it brought in a new line of kings.

The decision in the Dred Scott case was foreshadowed in the inaugural message of President Buchanan; it was hailed by him as the voice of authority that was to settle forever the vexed question of slavery or freedom in the territories of the Union.

Let us recall the situation: ever since the Missouri compromise of 1820, for more than a generation, slavery had been prohibited in the territories of the Union, by a law of congress, north of thirty-six degrees and thirty minutes. By a mad act of folly and ambition, this statute, whose validity was not previously questioned, was repealed in 1854, when the territories of Kansas and Nebraska were organized. The repeal reöpened a great debate, and brought in a fierce conflict; a debate on the merits and rights of slavery throughout the union, and a conflict on the territory of Kansas to secure the organization of the new state. This controversy was going on with great heat and passion when this remarkable cause was heard, and when Mr. Buchanan was sworn into office.

It was not a fictitious case, the facts were real; but the

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question as to the jurisdiction of the United States Circuit Court, *was* argued in St Louis in April, 1854, while the question of the repeal of the Missouri compromise was pending before congress.

On review the cause was twice argued. It was capable of being decided on the ground that the courts of the United States had no jurisdiction; or on the ground that the laws of Missouri, from which state the appeal came, were controlling and conclusive. But because one of the parties plaintiff was born above the line of 36° 30′ it seemed to give the opportunity to discuss and decide on the validity of the act of congress prohibiting slavery north of that line, and consequently upon the right to hold slaves in all the territories of the union.

The court had no sympathy with the enslaved people. A majority of the judges came forward, beyond the issues presented, to uphold and maintain the institution in its utmost rigor. They decided first on the question of jurisdiction, that a negro man could not be a citizen, and therefore could not bring a suit in the United States Circuit Court against the citizen of another state; that he could not be treated as a citizen because he was regarded by the framers of the constitution as having no rights, and no lot or part in the body of the people;. not even so good a *status* as a private corporation, a mere creature of the law has; and second, that while congress may organize and make all needful rules and laws for the government of a territory, it could not exclude slavery or legally establish the famous Missouri compromise of 1820; and that the people of a territory were equally without power to act upon the subject, because the constitution carried or recognized the institution as already existing in all the territories. From such a skillful combination of negative conclusions, with one daring affirmative, the inference was easy that Scott

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could not acquire his freedom by being taken into the territory north of the historic line of 36° 30′ and that his oldest child born above that line was nevertheless a slave.[1]

We do not question the personal integrity or good faith of these judges. Without being aware of it, they were being carried forward on a mighty current of opinion; in truth, as in theory, they delivered an impersonal opinion; they declared the law as they had been trained and educated to apprehend it. The dissenting judges did the same thing; coming to an exactly opposite conclusion. Perhaps no decision ever pronounced in America, shows more clearly the animus or what Montesqieu calls the spirit of the law; meaning thereby the natural drift and purpose of the law creating mind in a state or nation.

It is now only sixteen years since the decision was pronounced; and it stands there in the nineteenth volume of *Howard's Reports* as obsolete and dead as the slave code of Rome; the record of it has been blotted out with the blood of a civil war, and on its page has been written the new law of equal rights for all men.

There are two considerations bearing upon the decision which perhaps ought not to be overlooked; one relates to

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[1] Chief Justice Taney, Md., Leading Opinion.

Wayne, Ga.,	agreeing with him.		
Greer, Pa.,	"	"	and with Nelson; prima facie jurisdiction.
Daniels, Va.,	"	"	
Campbell, Ala.,	"	"	(does not touch question of jurisdiction).
Catron, Tenn.,	"	"	on other grounds; asserts power of congress on other subjects.
Nelson, N. Y.,	"	"	Hardly touches the power of congress, goes upon the laws of Mo., and question of jurisdiction.
McLean, O.,	Dissents totally.		
Curtis, Mass.,	"		

Conclusion: "that it appears by the record that the plaintiff is not a citizen of Missouri, and that the Circuit Court of the United States for that reason had no jurisdiction in the cause and could give no judgment in it. Judgment for that reason reversed, with a direction that the suit be dismissed for want of jurisdiction."

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citizenship, and the other to the merits and defects of a written, and therefore inflexible constitution. From the earliest times the term *citizen* has carried with it the notion of privilege. During its early history, the citizens of Rome constituted a real aristocracy. Following out the law of her development, the rights of citizenship were at length extended to the body of the people, to other communities and even to distant towns and cities. We find the word conveying a similar sense in modern times. It flashes out in the first French revolution, a name of such potential charm that it ends, after a while, in a *citizen king*. No one stops to inquire precisely what rights belong to him as a citizen. We all assume without debate, we have been educated up to this point, that whoever has the right to vote and own the soil he cultivates, is a citizen; and yet we all know that a woman and a child is compassed about with the rights of citizenship.

The consequences flowing from a written constitution meet us every day. They assume the features of sharply defined statute law; and so we often find a great question of public and state policy hinge upon the interpretation of a single word or phrase. The court is under oath, sworn to uphold the constitution; it is not free to seek out the path of reason; it must go by the written law. Under an unwritten constitution, like that of England, the courts, and every branch of the government, have much greater freedom; reason, guided by precedent, plays a more important role; the constitution is not amended by a positive act, it is developed, like the common law, by the inspiring reason which gives form and character to every growing people.

The memoir of the chief justice is written, as its author tells us, to vindicate the chief against the unjust aspersions, hatred and calumny, which were provoked by this celebrated decision. It reproduces the opinion, and aims at a reversal of the public judgment; unwisely, as we think, it attempts

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to justify the uncalled for decision of a bare majority of the court, denying to congress the right of affirmative legislation over a territory, on one subject only. The fame of the chief justice is secure, if it be left to the main current and tenor of his life: it is not so secure when it is made to hinge on the correctness of a judgment hardly supported by the strict letter of the law, with an adverse action upon a disfranchised race.

The chief justice had presided over the court now more than twenty years, and he was in the eightieth year of his age when the opinion was pronounced. It is scarcely fair to his memory, to seize upon the decision as a just criterion of his merits as a magistrate. It may show, it certainly does show, great intellectual vigor.

It is claimed in his defence, and the remark is often made, that he did not express it as his personal opinion that "a negro has no rights which a white man is bound to respect." And this claim is literally true; he attributes this opinion to the people and age in which the constitution was framed: the apology is nevertheless one of verbal criticism, rather than one of substance; because, as we understand the subject, it is the opinion then pronounced by the court which was relied upon to infuse that opinion into the constitution. A plain man cannot find the sentiment in the words of that great document; and if he deal candidly with the history of those times, he will be slow, he will hesitate to impute to its framers an opinion so iniquitous and so at war with historic truth.

We have here a peculiar phase of character. This eminent man refused to own a slave, and yet gave the weight of his office and juridical skill to strengthen an evil heritage. Full of clemency towards the individual, he almost created a common law to uphold the system.

Let us however deal justly with his memory. He showed no bias of mind in his ordinary duties as a judge. He

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lived to the great age of eighty-seven, discharging the duties of his office with all fidelity. He lived in charity and good will towards men, and died at last without a stain upon his personal character. He saw the light before the battle of Saratoga had been fought, and, well stricken in years, he heard also the thunders of Gettysburgh.

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The Alchemy of Happiness. By Mohammed Ghazzali. Translated from the Turkish. By H. A. Homes.

The remarkable treatise, which I introduce to your notice, is a translation from one of the numerous works of the Arabian Philosopher, Abou Hamid Mohammed ben Mohammed al Ghazzali, who flourished in the eleventh century. He was born about the year A. D. 1056, or 450 of the Mohammedan era, at Tous in Khorasan, and he died in the prime of life in his native country about the year 1011, or 505 A. H. Although educated by Mohammedan parents, he avows that during a considerable period of his life he was a prey to doubts about the truth, and that at times he was an absolute sceptic. While yet comparatively young, his learning and genius recommended him to the renowned sovereign Nizam ul Mulk, who gave him a professorship in the college which he had founded at Bagdad. His speculative mind still harassing him with doubts, in his enthusiasm to arrive at a solid foundation for knowledge, he resigned his position, visited Mecca and Jerusalem, and finally returned to Khorasan, where he led a life of both monastic study and devotion, and consecrated his pen to writing the results of his meditations.

Mohammedan scholars of the present day still hold him in such high respect, that his name is never mentioned by them without some such distinctive epithet, as the "Scientific Imaum," or "Chief witness for Islamism." His rank in the eastern world, as a philosopher and a theologian, had naturally given his name some distinction in our histories of philosophy, and it is enumerated in connection with those of Averroes (Abu Roshd) and Avicenna (Abu Sina)

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as illustrating the intellectual life and the philosophical schools of the Mohammedans. Still his writings were less known than either of the two others. His principal work, *The Destruction of the Philosophers*, called forth in reply one of the two most important works of Averroes entitled *The Destruction of the Destruction.* Averroes, in his commentary upon Aristotle, extracts from Ghazzali copiously for the purpose of refuting his views. A short treatise of his had been published at Cologne, in 1506, and Pocock had given in Latin his interpretation of the two fundamental articles of the Mohammedan creed. Von Hammer printed in 1838, at Vienna, a translation of a moral essay, *Eyuha el Weled*, as a new year's token for youth.

It has been reserved to our own times to obtain a more intimate acquaintance with Ghazzali, and this chiefly by means of a translation by M. Pallia, into French, of his *Confessions*, wherein he announces very clearly his philosophical views; and from an essay on his writings by M. Smölders. In consequence, Mr. Lewes, who in his first edition of the *Biographical History of Philosophy*, found no place for Ghazzali, is induced in his last edition, from the evidence which that treatise contains that he was one of the controlling minds of his age, to devote an entire section to an exhibition of his opinions in the same series with Abelard and Bruno, and to make him the typical figure to represent Arabian philosophy. For a full account of Ghazzali's school of philosophy, we refer to his history and to the two essays, just mentioned. We would observe, very briefly however, that like most of the learned Mohammedans of his age, he was a student of Aristotle. While they regarded all the Greek philosophers as infidels, they availed themselves of their logic and their principles of philosophy to maintain, as far possible, the dogmas of the Koran. Ghazzali's mind possessed however Platonizing tendencies, and he affiliated himself to the Soofies or Mystics in his later years.

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He was in antagonism with men who to him appeared, like Avicenna, to exalt reason above the Koran, yet he himself went to the extreme limits of reasoning in his endeavors to find an intelligible basis for the doctrines of the Koran, and a philosophical basis for a holy rule of life. His character, and moral and intellectual rank are vividly depicted in the following extract from the writings of Tholuck, a prominent leader of the modern Evangelical school of Germany.

"Ghazzali," says Tholuck, "if ever any man have deserved the name, was truly a divine, and he may justly be placed on a level with Origen, so remarkable was he for learning and ingenuity, and gifted with such a rare faculty for the skillful and worthy exposition of doctrine. All that is good, noble and sublime, which his great soul had compassed, he bestowed upon Mohammedanism; and he adorned the doctrines of the Koran with so much piety and learning, that, in the form given them by him, they seem in my opinion worthy the assent of Christians. Whatsoever was most excellent in the philosophy of Aristotle or in the Soofi mysticism, he discreetly adapted to the Mohammedan theology. From every school, he sought the means of shedding light and honor upon religion; while his sincere piety and lofty conscientiousness imparted to all his writings a sacred majesty. He was the first of Mohammedan divines." (*Bibliotheca Sacra*, VI, 233).

Sale, in the preliminary discourse to his translation of the Koran, shows that he had discovered the peculiar traits of Ghazzali's mind; for wherever he gives an explanation of the Mussulman creed, peculiarly consonant to universal

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[1] PALLIA, Mémoire sur le manuscrit Arabe de la Bibliothèque Royale de Paris, No. 884, contenant un traité philosophique d' Algazali. Mèm. de l' Institut de France. Tome I, Savants étrangers. Paris, 1841, 4°.

SMÖLDERS, Essai sur les écoles philosophiques chez les Arabes et notamment sur la doctrine d' al Ghazzāli. Paris, 1842. 8°.

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reason and opposed to superstition, it will be found that he quotes from him.[1]

This treatise on the Alchemy of Happiness, or Kimiai Saadet, seems well adapted to extend our knowledge of the writings of Ghazzali and of the opinions current then and now in the Oriental world. Although it throws no light on any questions of geography, philology or political history, objects most frequently in view in translations from the Oriental languages, yet a book which exhibits with such plainness the opinions of so large a portion of the human race as the Mohammedans, on questions of philosophy, practical morality and religion, will always be as interesting to the general reader and to a numerous class of students, as the facts that may be elicited to complete a series of kings in a dynasty or to establish the site of an ancient city can be to the historian or the geographer. I translate it from an edition published in Turkish in 1845 (A. H., 1260), at the imperial printing press in Constantinople. As no books are allowed to be printed there which have not passed under the eyes of the censor, the doctrines presented in the book indicate, not only the opinions of eight hundred years since, but also what views are regarded as orthodox, or tolerated among the orthodox at the present day. It has been printed also in Persian at Calcutta.

In form, the book contains a treatise on practical piety, but as is the case with a large proportion of Mohammedan works, the author, whatever may be his subject, finds a place for observations reaching far wide of his apparent aim, so our author is led to make many observations which develop his notions in anatomy, physiology, natural philosophy and natural religion. The partisans of all sorts of opinions will be interested in finding that a Mohammedan

[1] Sale's *Koran*, vol. I, p. 326, and note.

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author writing so long since in the centre of Asia, had occasion to approve or condemn so many truths, speculations or fancies which are now current among us with the reputation of novelty. Many of the same paradoxes and problems that startle or fascinate in the nineteenth century are here discussed. He came in contact, among his contemporaries, with persons who made the same general objections to natural and revealed religion, as understood by Mohammedans, as are in our days made to Christianity, or who perverted and abused the religion which they professed for their own ends, in the same manner as Christianity is abused among us. And he engaged with earnestness now truthfully, and now erroneously, in refuting these men. His usual stand-point in discussion is equally removed from the most extravagant mysticism, and literal and formal orthodoxy. He attempts a dignified blending of reason and faith, requiring of his fellow men unfeigned piety in the temper and tone of an evangelical Christian. He reminds his readers, in these discourses, that they are not Mussulmans if they are satisfied with merely a nominal faith, and treats with scorn those who are spiritualists only in language and dress.

It is too narrow a view to adopt, in regard to a man of the sublime character of Ghazzali, that he obtained his ideas from any one school of thinkers, or that being in fellowship with the Soofies, that he was merely a Soofi. He was living in the centre of Aryan peoples and religions. He may have had his doctrine of the future life shaped by Zoroaster, and have been influenced by the missionaries of the Buddhists.

The practical religion taught in these homilies will give a favorable opinion of the state of mind of the more intelligent Mussulmans. They contain not the Mohammedanism of the creed or the catechism, but of the closet and the pulpit. The tenor of the book establishes the truth of

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Ibn Khallikan's remark in his *Biographical Dictionary* that "Ghazzali's ruling passion was making public exhortations."

While perusing these pages, and noticing how much of the language of Ghazzali corresponds in its representations of God, of a holy life and of eternity, with the solemn instructions to which we have listened from our infancy, we may think of the magicians who imitated the miracles of Moses with their enchantments. Yet assuredly a vivid and respectful interest must be awakened in our minds for the races and nations, whose ideas of their relations as immortal beings are so serious and earnest.

The translation I have endeavored to make a close transcript of the meaning of the Turkish; having especially sought to find appropriate equivalents for native idioms. I have designated the chapter and verse of nearly every passage quoted from the Koran. The omissions in the text, which are made apparent by signs, are limited to digressions of the author, to repetitions and to some of the illustrations; so that there is no interruption of the continuity of thought in the themes discussed. The Turkish edition itself was but a portion of the original work. Two or three notes are added, either explanatory of the text or illustrative of the author, from Oriental sources.

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The Alchemy of Happiness: by Mohammed Al Ghazzali.

CHAPTER I.— ON KNOWLEDGE OF THE SOUL, AND HOW KNOWLEDGE OF THE SOUL IS THE KEY TO THE KNOWLEDGE OF GOD.

O seeker after the divine mysteries! know thou that the door to the knowledge of God will be opened to a man first of all, when he knows his own soul, and understands the truth about his own spirit, according as it has been revealed, "he who knows himself knows his Lord also." And God proclaims in his holy book: "We will display our miracles in the different countries of the world, till it shall be demonstrated to them that the Koran is the truth,"[1] that is, let us show men in the visible world, and in their own souls, the wonderfulness of our works and the perfection of our power, that they may learn to know that the Lord God is Almighty and true, and that everything else besides is vanity.

O seeker of the mysteries! since there is nothing nearer to thee than thyself, and that still with thy soul alone, thou canst not discriminate anything, and art impotent to find out and know thyself, in what way canst thou become acquainted with anything else, and with that which is even separate from thyself? And how should'st thou be able to comprehend God, who in his nature cannot be comprehended, and of whose absolute essence it is not possible to give thee any explanation. If thou should'st say, "I perfectly know myself," we reply, that we have no doubt that what you are acquainted with is your own hand and foot, with your eye and mouth, and animals even have this kind of knowledge. You know also that if you are hun-

[1] Sura 41 : 53.

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gry, your stomach craves food, and that if you are cold, you desire clothing; but other animals also understand these things.

However, that knowledge of the soul which leads to the knowledge of God, is not of this kind. The knowledge which you need to possess is, to know what you are; how you are created; whence you are; for what you are here; whither you are going; in what your happiness consists, and what you must do to secure it; in what your misery consists, and what you must do to avoid it. And further, your internal qualities are distributed into animal, ferocious, demoniacal and angelic qualities. You need to know, therefore, what qualities predominate in your character, and in the predominance of which your true happiness consists. If your qualities are chiefly animal, the essence of which is to eat and drink, you will day and night seek after these things. If your qualities are of the ferocious kind, the essence of which is to tear and rend, to injure and destroy, you will act accordingly. If you are endowed chiefly with the qualities of devils, which consist in evil machinations, deceit and delusion, then you should know and be aware of it, that you may turn towards the path of perfection. And if you possess angelic qualities, whose nature it is to worship God in sincerity and continually to await the vision of His beauty, then like them you should unceasingly, resting neither day or night, be zealous and strive that you may become worthy of the vision of the Lord. For know, O student of the mysteries! that man was created to stand at the door of service in frailty and weakness, and wait for the opening of the door of spiritual union, and for the vision of beauty, as God declares in his holy word: "I have not created the genii and men except that they should worship me."[1]

[1] S. 51 : 56.

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These qualities, whether animal, or ferocious or demoniacal have been bestowed upon man, that by their means the body might be adapted to be a vehicle for the spirit, and that the spirit, by means of the body which is its vehicle, while here in this temporary home of earth, might seek after the knowledge and love of God, as the huntsman would seek to make the phœnix and the griffin his prey. Then, when it leaves this strange land for the region of spiritual friendship, it shall be worthy to partake of the mystery contained in the invitation, "enter in peace, O believers!"[1] and which is in the homage, "Peace is the word they shall hear from the merciful Lord."[2] People in general suppose that this refers to Paradise. Woe to him who has no portion in this knowledge! There is great danger in his path. The way of faith is veiled from his eyes.

If you wish, O seeker of the way! to know your own soul, know that the blessed and glorious God created you of two things: the one is a visible body, and the other is a something internal, that is called spirit and heart, which can only be perceived by the mind. But when we speak of heart, we do not mean the piece of flesh which is in the left side of the breast of a man, for that is found in a dead body and in animals: it may be seen with the eyes, and belongs to the visible world. That heart, which is emphatically called spirit, does not belong to this world, and although it has come to this world, it has only come to leave it. It is the sovereign of the body, which is its vehicle, and all the external and internal organs of the body are its subjects. Its especial attribute is to know God and to enjoy the vision of the beauty of the Lord God. The invitation to salvation is addressed to the spirit. The commandment is also addressed to it, for it is capable of happiness or misery. The knowledge of what it is in

[1] S. 50 : 33. [2] S. 36 : 58.

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reality, is the key to the knowledge of God. Beloved, strive to obtain this knowledge, for there is no more precious jewel. In its origin it comes from God, and again returns to him. It has come hither but for a time for intercourse and action.

Be sure, O seeker after knowledge! that it is impossible to obtain a knowledge of the heart, until you know its essence and its true nature, its faculties, and its relations with its faculties,—nor until you know its attributes, and how through them the knowledge of God is obtained, and what happiness is, and how happiness is to be secured. Know then, that the existence of the spirit is evident and is not involved in doubt. Still, it is not body, which is found in corpses and in animals generally. If a person with his eyes wide open should look upon the world and upon his own body, and then shut his eyes, everything would be veiled from his view, so that he could not see even his own body. But the existence of his spirit would not be at the same time shut out from his view. Again, at death, the body turns to earth, but the spirit undergoes no corruption. Still it is not permitted to us to know what the spirit is in its real nature and in its essence, as God says in his Holy Word: "They will ask you about the spirit. Answer, the spirit is a creation by decree of the Lord."[1] The spirit belongs to the world of decrees.

All existence is of two kinds, one is of the world of decrees, and the other is of the world of creation. "To him belongs creation and decree."[2] The matters which belong to the world of decrees are those which have not superficies, quantity, or form: to the world of creation belong those which do have both quantity and form. The creation spoken of in the verse is in the sense of foreordination and not of actual formation. Hence those who say that the

[1] S. 17: 87. [2] S. 7: 52.

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spirit is created, and is also from all eternity are in error, for nothing is eternal except the being and attributes of God.

Those also, who say that the spirit is but an accident, are in error, for the spirit exists by itself in the body, and an accident is that which subsists with something else. And those who say that the spirit is matter are in error, for matter is that which can be divided, and spirit is not susceptible of division. There is spirit, beloved, which is called animal spirit, which is susceptible of division. It is found in animals. But that spirit, which has the property of knowing God, and which is called the heart, is not found in beasts, nor is it matter or an accident. The heart, on the contrary, has been created with angelic qualities. It is a substance of which it is difficult to apprehend the essence. The law does not permit it to be explained, but there is no occasion for the student being acquainted with it at the outset of his journey. That which is necessary to the student is pious ardor and zeal, and this must be called into exercise in perfection. It is God who graciously teaches the student what spirit is, as we find in the Holy Book: "We will direct in our way, all those who shall strive to propagate our worship."[1] And if a man does not strive earnestly for the faith, there is no use of explaining to him the essence of spirit. It is, however, lawful to explain to him the instruments by which it operates.

Know, O seeker after the divine mysteries! that the body is the kingdom of the heart, and that in the body there are many forces in contrariety with the heart, as God speaks in his Holy Word: "And what shall teach thee the forces of thy Lord?" The heart was destined to acquire a knowledge of God, in which its happiness consists. But we

[1] S. 29: 69.

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cannot grow in the knowledge of God, unless we understand the works of God.

The works of God are apprehended by the senses, which are five, hearing, sight, taste, smell and touch. For such an arrangement of the senses, there was also need of a body. The body itself is composed of four diverse elements, water, earth, air and fire. Being, therefore, liable to decay, it is in continual danger of perishing from the external and internal enemies that perpetually assail it. Its external enemies, are such as wild beasts, drowning and conflagrations; its internal enemies, such as hunger and thirst. For the purpose of resisting these, it was in want of various internal and external forces, such as the hand and foot, sight and hearing, food and drink. And in this connection, for eating and drinking, it is in want of internal and external instruments like the hand, the mouth, the stomach, the powers of appetite and digestion. In addition to these instruments, there was need of means to guide in their occasional use, that is, for the internal senses. These are five, the faculties of perception, reflection, memory, recollection and imagination. Their home is in the brain, and each has a specific function, as is well known to the learned. If to any one of all these faculties and instruments an injury occurs, the actions of man are defective. Now all these are the agents of the heart and subject to its rule. If, for example, the heart gives permission to the ear, hearing results; if it gives permission to the eye, there follows sight; if it gives permission to the foot, there is movement. All the other members are obedient in the same manner to the commands of the heart. The divine plan in all this arrangement is, that while the members preserve the body for a few days from harm, the heart, in its vehicle the body, should pursue its business of cultivating the seeds

[1] S. 74: 34.

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of happiness for eternity and prepare for its journey to its native country. So long as the various forces of the body are obedient to the dictates of the heart, in like manner as the angels obey in the presence of God, no contrariety of action can arise among them.

Know, O student of wisdom! that the body, which is the kingdom of the heart, resembles a great city. The hand, the foot, the mouth and the other members resemble the people of the various trades. Desire is a standard bearer; anger is a superintendent of the city, the heart is its sovereign, and reason is the vizier. The sovereign needs the service of all the inhabitants. But desire, the standard bearer, is a liar, vain and ambitious. He is always ready to do the contrary of what reason, the vizier, commands. He strives to appropriate to himself whatever he sees in the city, which is the body. Anger, the superintendent, is rebellious and corrupt, quick and passionate. He is always ready to be enraged, to spill blood, and to blast one's reputation. If the sovereign, the heart, should invariably consult with reason, his vizier, and, when desire was transgressing, should give to wrath to have power over him (yet, without giving him full liberty, should make him angry in subjection to reason, the vizier, so that passing all bounds he should not stretch out his hand upon the kingdom), there would then be an equilibrium in the condition of the kingdom, and all the members would perform the functions for which they were created, their service would be accepted at the mercy seat, and they would obtain eternal felicity. . . .

If you desire, inquirer for the way, with thankfulness for these mercies, to obtain eternal happiness in the future mansions, the heart must enthrone itself like a sovereign in its capital, the body, must stand at the door of service and direct its prayers to the gate of eternal truth, seeking for the beauty of the divinity. It must take reason for its

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vizier, desire for its standard bearer, anger to be the superintendent of the city, and taking the senses of reason as its spies, it must make each one of them responsible in its sphere. The perceptive faculties which are foremost in the brain, it must make to be chiefs of the spies, that they may convey to the spies notices of what occurs in the world. The faculty of memory, which is next in order in the brain, it must use as a receptacle in which it may treasure up whatever is noticed by the spies, and, as occasion requires, may inform reason, the vizier. The vizier, in accordance with the information received, will administer the kingdom. When he sees any one of the soldiers revolting and following his own passions, he will represent it to the sovereign, that he may be controlled and conquered. He must not, however, be destroyed, for each one of us has received, from his original country, a definite commission, and in that case this service must remain unfulfilled. But, alas! if the heart should swerve from its sovereignty, and not make use of reason as its vizier, and should be reduced by the standard bearer, desire, and the superintendent, anger, all the forces would then follow in the train of desire and anger, the kingdom would fall into disorder, and everlasting ruin would be the result. . . .

If you inquire, O student! how it is known that the heart of man has been created in accordance with the qualities of angels, seeing that the most of the qualities and attributes of angels are foreign to it, I reply, you know that there is not, in truth, any creature on the face of the earth more noble than man, and that it belongs to the dignity and perfection of every creature, to work out perseveringly that service for which it was created. The ass, for instance, was created to bear burdens. If he carries his load well, without stumbling or falling, or if he does not throw off his load, his qualities are in perfection, and his service is accepted. The horse was designed also for war

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and military expeditions, and has strength to carry burdens. If he performs his duty well, in time of war, in running, fleeing and going to meet the enemy, his service is accepted, and he will be treated with attention in his accoutrements, grooming and feeding. But if he performs his service imperfectly, a pack saddle will be put on his back, as on the ass, from day to day he will be employed as a beast of burden, and he will be carelessly and deficiently provided with food, and poorly taken care of.

Besides, beloved! if man had been created only to eat and drink, it would follow that animals are of greater worth and excellence than man; for they can eat and drink more than man can, and they have useful services devolved upon them of drawing burdens, tilling the ground, and giving meat, butter and milk for food. If also man had been created to fight, kill and domineer, it would follow that beasts of prey are nobler than he, for they are mightier in their ferocity and their power of subjugating other animals. There are, moreover, many animals of manifest utility, as the dog to watch and hunt, and the skins of some of them for clothing. It follows, therefore, that man was not created for these things, but rather to serve God and to grow in the knowledge of him.

It is plain that mind, discernment and reason were bestowed upon man, that when he looks upon the world and sees in every object illustrations of various forms of perfection, and much to excite his wonder, he might turn his attention from the work of the artist, to the artist himself; from the thing formed to him that formed it; that he might comprehend his own excessive frailty and weakness, and the perfection of the wisdom and power, yea, of all the attributes of the eternal Creator, and that, without ceasing, he might humbly supplicate acceptance in his frailty and weakness on the one hand, and on the other might seek to draw near to the King of kings, and finally obtain rest in

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the home of the faithful, where the angels are in the presence of God. If men refuse to recognize their own dignity, if they neglect their duty and prefer the qualities of devils and beasts of prey, they will also possess, in the future world, the qualities of beasts of prey, and will be judged with the devils. Our refuge is in God!

Know, thou seeker of divine mysteries! that there is no end to the wonderful operations of the heart. For, to pursue the same subject, the dignity of the heart is of two kinds; one kind is by means of knowledge, and the other through the exertion of divine power. Its dignity by means of knowledge is also of two kinds. The first is external knowledge, which every one understands: the second kind is veiled and cannot be understood by all, and is extremely precious. That which we have designated as external, refers to that faculty of the heart by which the sciences of geometry, medicine, astronomy, numbers, the science of law and all the arts are understood; and although the heart is a thing which cannot be divided, still the knowledge of all the world exists in it. All the world indeed, in comparison with it, is as a grain compared with the sun, or as a drop in the ocean. In a second, by the power of thought, the soul passes from the abyss to the highest heaven, and from the east to the west. Though on the earth, it knows the latitude of the stars and their distances. It knows the course, the size and the peculiarities of the sun. It knows the nature and cause of the clouds and the rain, the lightning and the thunder. It ensnares the fish from the depths of the sea, and the bird from the end of heaven. By knowledge it subdues the elephant, the camel and the tiger. All these kinds of knowledge, it acquires with its internal and external senses.

The most wonderful thing of all is, that there is a window in the heart from whence it surveys the world. This is called the invisible world, the world of intelli-

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gence, or the spiritual world. People in general look only at the visible world, which is called also the present world, the sensible world and the material world; their knowledge of it also is trivial and limited. And there is also a window in the heart from whence it surveys the intelligible world. There are two arguments to prove that there are such windows in the heart. One of the arguments is derived from dreams. When an individual goes to sleep, these windows remain open and the individual is able to perceive events which will befall him from the invisible world or from the hidden table of decrees,[1] and the result corresponds exactly with the vision. Or he sees a similitude, and those who are skilled in the science of interpretation of dreams understand the meaning. But the explanation of this science of interpretation would be too long for this treatise. The heart resembles a pure mirror, you must know, in this particular, that when a man falls asleep, when his senses are closed, and when the heart, free and pure from blameable affections, is confronted with the preserved tablet, then the tablet reflects upon the heart the real states and hidden forms inscribed upon it. In that state the heart sees most wonderful forms and combinations. But when the heart is not free from impurity, or when, on waking, it busies itself with things of sense, the side towards the tablet will be obscured, and it can view nothing. For, although in sleep the senses are blunted, the imaginative faculty is not, but preserves the forms reflected upon the mirror of the heart. But as the perception does not take place by means of the external senses, but only in the imagination, the heart does not see them with absolute clearness, but sees only a phantom. But in death, as the senses are completely separated and the veil of the body is removed, the heart can contemplate the in-

[1] See note A.

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visible world and its hidden mysteries, without a veil, just as lightning or the celestial rays impress the external eye.

The second proof of the existence of these windows in the heart, is that no individual is destitute of these spiritual susceptibilities and of the faculty of thought and reflection. For instance every individual knows by inspiration, things which he has neither seen nor heard, though he knows not from whence or by what means he understands them. Still, notwithstanding the heart belongs to the invisible world, so long as it is absorbed in the contemplation of the sensible world, it is shut out and restrained from contemplating the invisible and spiritual world.

Think not, thou seeker after the divine mysteries! that the window of the heart is never opened except in sleep and after death. On the contrary, if a person calls into exercise, in perfection, holy zeal and austerities, and purifies his heart from the defilement of blameable affections, and then sits down in a retired spot, abandons the use of his external senses, and occupies himself with calling out "O God! O God!" his heart will come into harmony with the invisible world, he will no longer receive notions from the material world, and nothing will be present in his heart but the exalted God. In this revelation of the invisible world, the windows of the heart are opened, and what others may have seen in a dream, he in this state sees in reality. The spirits of angels and prophets are manifested to him and he holds intercourse with them. The hidden things of earth and heaven are uncovered to him, and to whomsoever these things are revealed, mighty wonders are shown, that are beyond description. As the prophet of God says: "I turned towards the earth, and I saw the east and the west." And God says in his word: "And thus we caused Abraham to see the kingdom of heaven and earth,"[1] which is an example of this kind of revelation.

[1] S. 6: 75.

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Probably the knowledge of all the prophets was obtained in this way, for it was not obtained by learning. . . .

When the heart is free from worldly lusts, from the animosities of society and from the distraction occasioned by the senses, the vision of God is possible. And this course is adopted by the Mystics.[1] It is also the path followed by the prophets. But it is permitted also to acquire the practice of it by learning, and this is the way adopted by the theologians. This is also an exalted way, though in comparison with the former, its results are insignificant and contracted. Many distinguished men have attained these revelations by experience and the demonstration of reasoning. Still let every one who fails of obtaining this knowledge either by means of purity of desire or of demonstration of reasoning, take care and not deny its existence to those who are possessed of it, so that they may not be repelled from the low degree they have attained, and their conduct become a snare to them in the way of truth. These things which we have mentioned constitute the wonders of the heart and show its grandeur.

Think not that these discoveries of truth are limited to the prophets alone. On the contrary every man in his essential nature is endowed with attributes rendering him capable of participating in the same discoveries. What God says, "Am I not your Lord?"[2] refers to this quality. And the holy saying of the prophet of God: "Every man is born with the nature of Islamism; but his ancestors practised Judaism, Nazarenism or Magianism," is an indication of the same thing.

The heart of man while in the spiritual world knew its maker and creator; it had mingled with angels and knew for what service it was created; and in the assembly where they said, "Yes," it was intoxicated as with wine at the

[1] See note B. [2] S. 7: 171.

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interrogation, "Am I not your Lord?" As at that moment, it was seen with the eye of certainty, no person had any doubt on the subject, as God says in his holy word: "If you ask them, who created the heavens and the earth, they will answer thee, the wise and holy God."[1] All the prophets were apparently of the same nature as other men without any difference, as we find in God's holy word: "Say, I am a man like you: it was revealed to me."[2] Afterwards the heart descended from the world of divine union to this house of separation, from that assembly of love to this station of sorrow, and from the spiritual to the material, and entering within the curtain of the senses, it became occupied with the care of the body and was overcome by the animal affections and material pleasures. The heart of man, veiled with the garments of heedlessness, forgot the assembly with which it had been familiar, and imagining that this miserable place was to be its mansion of rest, it chose to establish itself here in this world of perdition, as if this was its home. Still the veil of heedlessness disappeared from the eyes of those to whom the grace and guidance of the Eternal and unchangeable gave aid and support, and the discovery of the invisible world was not concealed from the view of some of those who came into this material world, but was anew revealed to them, after a measure of exertion of spiritual ardor.

To whomsoever this revelation has been vouchsafed, if it direct him to reform the world, to invite the nations to turn to God, and to a peculiar way of life, that person is called a prophet, and his way of life is called a law; and that influence which proceeds from him, which transcends what is ordinary, is called a *miracle.* If he has not been appointed to invite the nations, but worships in accordance with the law of another, he is called a saint, and that which

[1] S., 43: 8.
[2] S., 18: 110.

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proceeds from him, which transcends what is ordinary, is called a *manifestation of grace.* The miracle performed by a saint is accounted a miracle of that prophet whose law he follows. He who has received, by whatever means, a revelation of the invisible world, is capable of being ordained to the office of a prophet. And if he is not appointed by God, the reason will be either, that at the time the existing law had been newly revealed, and that there was no occasion for a prophet, or else that there may be a peculiarity in prophets which is not found in the saints. It follows that it is our duty not to deny either the saintship or the miracles of the saints, but to acknowledge them as real.

You should be aware, however, that this alchemy of happiness, that is, the knowledge of God, which is the occasion of the revelation of truth, cannot be acquired without spiritual self-denial and effort. Unless a man has reached perfection and the rank of Superior, nothing will be revealed to him, except in cases of special divine grace and merciful providence, and this occurs very rarely. Nor, except by divine condescension, is revelation obtained even by all who by effort reach the rank of Superior. And whosoever would attain holiness can only reach it by the path of difficulty.

You have now learned, student of the divine mysteries, the dignity of the heart through knowledge, and what kind of knowledge it possesses. Now listen and learn its dignity through divine power and on account of the greatness of which it is capable, that you may see how precious you are in yourself, and yet how vile and contemptible you make yourself by your own choice. Know then, that the heart is endowed with properties like those of angels and such as are not found in animals; and just as the material world is subjected by divine permission to the angels, and when God wills it, the angels send forth the winds, cause rain to

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fall, bring forth the embryo in animals, shape their forms, cause seeds to sprout in the earth and plants to grow, many legions of angels being appointed to this service, so also the heart of man being created with angelic properties must have influence and power over the material world. In man's own body, which is peculiarly his own world, its control and influence are very evident. The hand, for example, does not in writing move of itself, but depends for motion on volition proceeding from the heart. And in eating, it is the heart which by an exertion of its will, causes moisture to rise in the mouth from under the tongue, to mix with the food that it may be swallowed and digested. These facts clearly substantiate the dominion and control of the heart, and the subordination of the body.

Know also, that if the heart should not be tarnished with the rust of rebellion, and if the animal and ferocious qualities should not be dominant, that it would be capable, on account of the presence in it of angelic properties, of manifesting this same influence over other bodies. If it should look upon a lion or tiger with severity, they would become weak and submissive. If it should look with kindness upon one who is sick, his infirmity might be changed to health. If it should look upon the vigorous with majesty, they might become infirm. The reality of the existence of these influences is known both by reason and experience. Sorcery with the eyes, is of this kind of power. If for example, a man of a malicious disposition look upon some little thing with envy, and if while he is looking, the destruction of the object should come into his mind, an influence upon it may be observed immediately, and directly or after a while that object will be destroyed: the prophet of God has said: "the eye brings man to the grave and the camel to the seething pot."

In whomsoever these influences are shown to have power, if he occasion misery in the exercise of this power, he is

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designated a sorcerer. Although as has been seen, the power of performing signs, miracles and sorceries belongs to the heart when its faculties are in perfect operation, yet there are important destinctions between these powers. And whoever is of a narrow mind will not be able to appreciate that signs and miracles are influences proceeding from the heart of man, unless he should learn it by external teaching.

The heart has dominion and control through three channels. One is through visions, by which revelations are made to all men. But the kind of mysteries generally revealed to people in visions, are revealed to prophets and saints in the outward world. The second kind is through the dominion which the heart exercises over its own body, a quality, which is possessed by all men in general, though prophets and saints for the good of the community, possess the same power over other bodies than their own. The third source of dominion of the heart is through knowledge. The mass of men obtain it by instruction and learning, but it is bestowed by God upon prophets and saints directly, without the mediums of learning and instruction. It is possible also for persons of pure minds to acquire a knowledge of some arts and sciences without instruction, and it is also possible that some persons should have all things opened up to them by the will of God. This kind of knowledge is called "infused and illuminated," as God says in his word: "we have illuminated him with our knowledge."[1] These three specialities are all of them found in certain measure in some men, in others two of them are found, and in others, only one is found: but whenever the three are found in the same person, he belongs to the rank of prophets or of the greatest of the saints. In our Lord the prophet Mohammed Mustafa, these three specialities

[1] S., 18: 64.

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existed in perfection. The Lord in bestowing these three properties upon certain individuals, designates them to exhort the nations and to be prophets of the people. To every man there is given a certain portion of each one of these peculiarities, to serve as a pattern.

Man cannot comprehend states of being which transcend his own nature. Hence none but the great God himself can comprehend God, as we have shown in our Commentary upon the "Names of God." So also the prophets cannot be comprehended by any but the prophets themselves. No person, in short, can understand any individual who belongs to a scale of rank above him. It is possible that there is a peculiarity in prophets, of which no pattern or model is found in other persons, and therefore, we are incapable of understanding them. If we knew not what a vision is, and an individual should say to us, that a man, at a moment when he can neither move, see or hear, can perceive events which are to occur at a future period, and yet might not be able to perceive the same while walking, listening or looking, we should not in any wise be able to persuade ourselves of the truth of it, as God says in his Holy word: "They treat as a lie that which they cannot comprehend with their knowledge."[1] And you, do you not see that he who comes blind into the world, does not understand the pleasure which is derived from seeing? Let us not regard, therefore, as impossible all those states ascribed to the prophets which we cannot understand: for they are the accepted and praiseworthy servants of God.

From all which has been said, Seeker after the divine mysteries, thou hast learned something of the dignity of the nature of man, and that the way of the Mystics is holy and honorable. But I have heard that the Mystics say that external knowledge is a veil upon the way to God, and

[1] S., 10: 40.

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a hindrance in the journey to the truth. Take care and do not deny that they are correct in what they say. For, external knowledge is derived from the sensuous world, and all objects of sense are a hindrance to him who is occupied with spiritual truth; for whoever is attending to sensual objects, indicates that his mind is preoccupied with external properties. And it is impossible that he who would walk in the way of truth, should be for a moment unemployed in meditation, upon obtaining spiritual union and the vision of Beauty.

Know, student of the divine mysteries, that the heart is like a reservoir into which five streams flow: these streams at one time run clear, and at another, turbid, and hence the bottom of the reservoir contains much mud. If a person wish to cleanse the reservoir and to get rid of the mud in the bottom, he must first dam up the course of the running streams, and then stir up and put in motion the mud, and until the muddy water has been carried off by the pure water that gushes up at the bottom of the reservoir, he will not allow any other water to run in. Now the external senses resemble those running streams, from which various kinds of knowledge, notions and prejudices proceed to the heart, of which some are pure and purifying, and some are corrupt and corrupting, and until these have been dammed up, the windows of the heart cannot be uncovered so that the illuminating knowledge from God can be revealed to it.

If a person possessing great knowledge of the outward world, should use his knowledge as a means of progress in the way of truth, instead of being satisfied with such disputes as of buying and selling, marrying and divorcing, and should be assiduous in gaining divine knowledge, which is the end of all other knowledge, it is all well and good. His knowledge of the outward world will give him strength in his course, and will serve as a guide to him in

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the way to eternal truth. For if the pilgrim do not understand the grounds of the respect due to, and the lawfulness of his food and drink, his dwelling and his clothing, if he do not understand the causes which impair or render complete acts of purification and devotion, what has a tendency to give strength to the blameable affections of the soul, and what is their nature and their remedy, he can derive no advantage from the sciences of spiritual exercise, discovery and revelation. In short to an ignorant pilgrim, the least doubt may operate as a hindrance in his course for many years. If, however, he should fall into a spirit of disputation, and should say, "knowledge implies nothing else than to be able to study a book and to correct the composition, the punctuation and the declensions," he will certainly be frustrated from obtaining and discovering inward knowledge, — that is, he will not attain to the knowledge of God, which is the object of all knowledge, which is the most sublime knowledge, and compared with which all other knowledge is but husks. Therefore, when we hear some good man, who has travelled far on the road of spiritual discovery affirm, that knowledge of the external world, in the sense which we at first alluded to, is a hindrance in the way of truth, we ought to be careful not to deny the truth of what he says.

There are, however, in our times certain weak persons and indifferent to religious truth for the most part, who in the guise of soofees,[1] after learning a few of their obscure phrases and ornamenting themselves with their cap and robes, treat knowledge and the doctors of the law[2] as inimical to themselves, and continually find fault with them. They are devils and deserve judicial death. They are enemies of God, and of the apostle of God. For God has extolled knowledge and the doctors of the law; and the

[1] Mystics. [2] *Ulema*, the clerical and theological class.

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established way of salvation, with which God has inspired the prophets, has its basis in external knowledge. These miserable and weak men, since they have no acquaintance with science, and no education, and knowledge of external things, why should they indulge in such corrupt fancies, and unfounded language? They resemble, beloved, a person who having heard it said that alchemy was of more value than gold, because that whatsoever thing should be touched with the philosophers' stone would turn to gold, should be proud of the idea and should be carried away with a passion for alchemy. And when gold in full bags is offered him, he replies. "Shall I turn my attention to gold, when I am dissolving the philosophers' stone?" And he finishes with being deprived of the gold, and with only hearing the name of the philosophers' stone. He becomes forever a miserable, destitute, and naked vagabond, who wastes his life upon alchemy.

The science then of revelation, or of infused spiritual knowledge, resembles alchemy, and the science of the doctors of the law resembles gold; but it is folly and pure loss not to accept and be satisfied with solid gold, on account of one's ardor to discover the philosophers' stone, which latter knowledge is not acquired by one in a thousand.

There is still one farther observation that deserves to be made. If a person by the payment of a thousand pieces of gold, could become master of alchemy, yet the condition of the man who is absolutely master of ten thousand pieces of gold would be better and preferable. And this illustrates the position of the soofees. If a person follow their method and attain to the knowledge of some things, he still does not equal in excellence, the doctors of the law. Just as we see, that books on alchemy, and students of alchemy are very numerous, while those who are successful are the least of few, so the path of mysticism is sought for by all men, and longed for by all classes of society, yet those who

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attain to the end are exceedingly rare. Perhaps, as in the case of alchemy, it only exists now in name and form. The greater part of the notions and fancies of most of the mystics, which they esteem as revelations and mysteries, are nothing but vain triflings and pure self complacency; just as that while visions are a reality, still mere confused dreams are very abundant. The mystic, however, who by spiritual revelation has learned all that a doctor of the law has been able to learn after many years of study, and who has no remaining doubts in matters of internal or external knowledge, is certainly more excellent than the doctor of the law who is learned only in external knowledge, and this should not be denied. And it follows that the way of the mystics must be acknowledged to be a true one, and that you must not destroy the belief of those weak minded and vain persons who follow them; for, the reason why they cast reproaches upon knowledge and calumniate the doctors of law is that they have no acquirements or knowledge themselves.

O, inquirer after divine mysteries! do you ask how it is known that the happiness of man consists in the knowledge of God, and that his enjoyment consists in the love of God? We observe in reply, that every man's happiness is found in the place where he obtains enjoyment and tranquility. Thus sensual enjoyment is found in eating and drinking and the like. The enjoyment of anger is derived from taking revenge and from violence. The enjoyment of the eye consists in the view of correct images and agreeable objects. The enjoyment of the ear is secured in listening to harmonious voices. In the same way the enjoyment of the heart depends upon its being employed in that for which it was created, in learning to know every thing in its reality and truth. Hence, every man glories in what he knows, even if the thing is but of little importance. He

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who knows how to play chess, boasts over him who does not know: and if he is looking on while a game of chess is played, it is of no use to tell him not to speak, for as soon as he sees an improper move, he has not patience to restrain himself from showing his skill, and glorying in his knowledge, by pointing it out. . . .

Now that it is clear that the happiness of the heart consists in the knowledge and love of God, we may say that the heart that does not feel the necessity of the knowledge of God, and a longing for the love of God, but rather craves after and seeks the world, resembles a sick person who has no appetite for food, but even prefers such things as earth and clay to meat, regarding them as necessary, notwithstanding they have no nourishing qualities. If no remedy can be found, speedily, to recover his appetite for food, and if he continue indulging in perverse notions of what is necessary, his malady will grow in strength; until if he continue in this state, he will perish and lose the joys this world can give. In the same manner the heart which does not feel a necessity for the knowledge and love of God, and where the love of other objects reigns, is a heart that is sick and ready to perish, unless a remedy be applied, unless its affections be turned away from other things, and the love of God become predominant. Future bliss will be lost and eternal misery will be its portion. Our refuge is in God!

You should know also that the enjoyments of this world that are procured through the senses are cut off at death. The enjoyment of the love and knowledge of God, which depends upon the heart, is alone lasting. At death the hindrances that result from the presence of the external senses being removed, the light and brilliancy of the heart come to have full play, and it feels the necessity of the vision of beauty. What has hitherto been said is sufficient to enable a person of intelligence to comprehend the

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dignity of the heart of man. The subject could not be discussed more at large in this short treatise.

While the heart is one of the pillars of man, the body is another pillar. In the constitution of man's body, there is an infinity of most wonderful things to be observed. Each internal and external organ has various curious uses, of which man is entirely uninformed. Know, that in the body of a man there are thousands of veins and nerves: there are many bones, each of a particular shape and each one created for a particular purpose and effect. You are ignorant of all this, and you only know that the hand was formed to take hold with, the foot to walk with, and the tongue to speak with. But in reference to the hand, you know nothing about its blood, its bones, the number of its nerves and veins, and the uses of each one: nor in reference to the eye, do you know that it is composed of ten layers, nor of what the layers are composed, nor what is the use of them. And if the eye should meet with an injury in one of the layers, you could not tell the cause of it. You know nothing either of the internal organs in the belly, such as the spleen, the liver, the gall-bladder and the kidneys. While these have been given to you to perform functions in which they are continually engaged, you are entirely unconcerned about it.

Know then, beloved, that the varieties of food you eat descend to the stomach, and thence to the liver, and that in the liver they are mixed and brought to the form of blood. Upon the liver may be seen something black and frothy which is called black bile. The spleen attracts the black bile and changes it into itself. The blood being still mixed with water, has no consistence, and the kidneys draw the water from the blood and purify it. This blood is then diffused to the seven parts of the body, and brings and conveys strength to the limbs. If the spleen become affected with any disorder, so that it cannot separate the black bile

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from the blood, such diseases as leprosy, insanity, inflammation of the spleen and remittent fever are the consequence. If any derangement happen to the gall-bladder so that it cannot secrete the bile, bilious disorders follow. If the kidneys get disordered, so that they cannot abstract the water from the blood, dropsy and similar diseases are the result. It all depends, however, on the will of God. In the same manner, all the organs of the body have a specific function. If it were not so, the body would perish. . . .

Our intention has been to show you that man is a great world, and that you might know what a multitude of servants his body has to minister to him: so that you might realize while in your enjoyments, in walking, in sleeping or at rest in your world, that by God's appointment, these numerous servants in your employ never suffer their functions to cease for a minute. Listen now for a moment candidly. If you had a servant who had been faithful to you during his whole life, with whose services you were not able to dispense, while he could at any time find a better master—yet if he should only for a single day disobey your orders, you would get angry, beat him, and wish to get rid of him. But God has been abundant in kindness to you, and has given you so many servants, and has in no wise any need of you. How then can it be just that you should become enslaved to yourself, and follow your own passions, and that forgetful of pleasing the infinite God, you should rebel against your Creator and Benefactor, and that you should render obedience to Satan, who is your enemy and the enemy of God?

Many and even innumerable books, O student of the divine mysteries, have been written in explanation of the organization of the body and the uses of its parts: but they have no more made the subject clear and exhausted it, than a drop can illustrate the ocean, or an atom illustrate the sun.

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It is impossible for the thing formed to understand the knowledge of him that formed it. And how is it possible, that he who is of yesterday, should comprehend the secrets of the operations of the Ancient of days?

The science of the structure of the body is called anatomy: it is a great science, but most men are heedless of it. If any study it, it is only for the purpose of acquiring skill in medicine, and not for the sake of becoming acquainted with the perfection of the power of God. But whoever will occupy himself with anatomy, and therein contemplate the wonders of the works of God, will reap three advantages. The first advantage will be, that in learning the composition of the thing made, and thereby gaining a comprehensive and condensed view of all other things like it he will see that it is impossible to discover imperfection or incompetence in the being who has created him in such perfection. The Creator himself will be acknowledged to be almighty and perfect. The second advantage will be, that he will see that it is impossible that a being who has created an organization so intelligent, capable of comprehension, endowed with beauty, and useful, should be otherwise than perfect in knowledge himself. And lastly, we shall understand the mercy, favor and perfect compassion of God towards us. Nothing that is either useful or ornamental has been omitted in the framing of our bodies, whether it be such things as are the sources of life, like the spirit and the head; or such as sustain life, as the hand, the foot, the mouth and the teeth: or such as are a means of ornament, as the beard, elegance of form, black hair and the lips. It is to be observed that similar organs have been provided not only for man, but for all creatures, so that nothing is wanting to initiate and sustain life in the mouse, the wasp, the snake and the ant. God has done all things perfectly, and may his name be glorified!

> The investigator of truth this fact well knows,
> That he himself is endowed with every perfection.

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The knowledge of anatomy is the means by which we become acquainted with animal life: by means of knowledge of animal life, we may acquire a knowledge of the heart, and the knowledge of the heart is a key to the knowledge of God. But the knowledge which we obtain of God is limited and contracted in comparison with the knowledge which the heart has of itself. The knowledge possessed by the heart in comparison with the knowledge of God himself, is but as an atom when compared with the sun.

The body is but an animal to be ridden by the heart, which is its rider, while the heart's chief end is to acquire a knowledge of God. The dignity of any thing depends upon what it is in itself. A person therefore who does not understand his own body, heart and soul, and yet pretends to the knowledge of God, resembles the bankrupt, who, although he has nothing to eat himself, should yet plan a feast for all the poor of the city. In short, man ought to make every possible exertion to gain the knowledge of God, because the knowledge of God necessitates the love of God. Just in the same manner as when you see a beautiful specimen of calligraphy or some elegant verses, you praise the person who made them, you feel a love for him in your heart and desire eagerly to see him.

Since you have learned, O inquirer after the divine mysteries, the dignity and nobleness of the heart, know also that this precious jewel has been confided to you and wrapped in a veil, that you may preserve it from too close a contact with the world, and may lead it to perfection and to its place of rest, making it a partaker of manifest happiness in the eternal mansions. In the house of reunion you will have reached an eternal rest, where no evil enters, a joy where no pain mingles, a strength without infirmity, a knowledge without doubt, and a vision of the Lord, the enjoyment of which shall be endless.

If the heart strive not after its own glory and dignity, but

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inclines to the cares of the world and sensual pleasures, no creature is more feeble, infirm and contemptible than man. At one time he will be the slave of disappointment and melancholy, at another suffering from disease and misfortune; at one time exposed to hunger and thirst, and at another the slave of avarice or ambition. He is not indulged with the enjoyment of a single day in peace. And when he is disposed to partake of the pleasures of the world and stretches out his hand to them, for a long time he cannot succeed in freeing himself from calamity. Even the pleasure of eating will be attended with oppression and pain, and afterwards be followed by some adverse accident. In short, of whatever enjoyment he partakes, regret is sure to follow it. If we regard knowledge, power, will, beauty and grace of form as constituting the glory and honor of this world, what is the wisdom of man? If his head pain him, he knows not the cause or the remedy. If he have pain at his heart, he knows not the occasion of it, or why it increases, or what will cure it. He sees the plants and medicines that could cure it, perhaps even holds them in his hands, and is not aware of it. He knows nothing of what will happen to him on the morrow, nor what action will be a source of enjoyment to him, nor what will be to him a source of pain. If you look only to the strength of a man, what is more impotent than he is. If a fly or mosquito molest him, he cannot get rid of it. If he is attacked by disease, he has no remedy to meet it with. He has no power to preserve himself from destruction. If you look at the firmness and resolution of man, what is more contemptible than he is! If he see any thing more extraordinary than a piece of money, he changes color and loses his presence of mind. If a beggar meet him, he turns away, and dares not look him in the face. If you look at the form of man, you see that it is skin, drawn over blood and impurity. . . .

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In short, man in this world, is framed in infirmity and imperfection. But if he desire and will to free himself from animal propensities, and ferocious and satanic qualities, he may attain future happiness, will be more exalted and excellent than a king and will be enriched with the vision of the beauty of the Lord. But if he incline towards the world, and retain only the qualities of animals and wild beasts, his future state will be worse even than theirs. For they turn to dust, and are delivered from pains and torment. Our refuge is in God!

From the moment, O beloved! that you have learned in what the dignity and nobleness of man consists, and what constitutes his vileness and meanness, you have learned at the same time how the knowledge of the soul, is the key to the knowledge of God.

Chapter II.— On the Knowledge of God.

In the books of former prophets it is written, "Know thine own soul, and thou shalt know thy Lord," and we have received it in a tradition, that "He who knows himself, already knows his Lord." This is a convincing argument that the soul is like a clean mirror, into which whenever a person looks, he may there see God. If you say, however, that there are many who have studied themselves, and have learned that they are creatures, and still they do not know their Lord, I reply, that to pass from the knowledge of the soul to the knowledge of God, and to demonstrate the latter

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from the former, may be accomplished by two methods. The first method is most deep and profound. The most exalted in wisdom and the most penetrating among men are far from understanding it, even when they apply themselves to it, both with science, practice and a pure life. How then should those ignorant persons understand it, who are utterly destitute of a knowledge of external things! Let us, therefore, pass to the second method and explain that: for he who possesses a discriminating mind, even if he were blind, is capable of understanding it.

Know, therefore, that man from his own existence knows the existence of a Creator; from his own attributes, he knows the attributes of his maker; from the control which he has over his own kingdom, he knows the control that God exercises over all the world. The reason of this is, that when a man looks at himself, beginning at the time when there was no trace or notion of his existence, and contemplates his creation with attention, he sees that he had his origin from a drop of water. He had neither mind or understanding: and neither fat, flesh nor bones. Afterwards by divine operation and sovereign power, most strange and wonderful internal changes took place, and strong organs, passions, affections, and agreeable qualities rose up all adorned with beauty. When man comes to look upon his organs and members, whether upon the external, as the hand, the foot, the eye, the tongue and the mouth, or upon the internal organs, as the liver, the stomach and the spleen, he sees that each is the result of a special wisdom, that each one has been created for some peculiar use, and that each one is in its place and perfect. After a man has observed these things, he knows that the Creator has power to do what he pleases with all things, that his knowledge includes and embraces in perfection whatever is to be known of crea-

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tures either externally or internally, and that his power and wisdom pervade every organ and particle.

Beloved, in proportion as a man analyzes the nature of his body and the variety of uses of its several members, his reverence and love for its Creator and Maker will increase. Let a man observe, for example, that his hands are made like columns and separated from the body, to serve as an instrument to seize, or take hold of, or to defend it from an enemy. At the extremity of the hands are five fingers, four of which are in a row, and some long and some short, so that when they take hold of anything, they may come equally together in the palm of the hand. The thumb, which is opposite to the four fingers, is shorter than any of them and stronger, that it may be a help to the whole and render them capable of retaining and grasping. The four fingers have three joints each, and the thumb has but two, that when contracted they may become like the bowl of a spoon or ladle, and that when open they may become like a plate, and so discharge an infinity of services. The front teeth were formed sharp, to cut and separate the food: the side teeth were formed broad to mash and grind the food. The tongue was formed like a spoon to throw the food into the throat. There is, also, under the tongue, an organ by which water is poured out, and the food is made of the consistence of dough, that it may be more easily swallowed and digested. All the organs, in short, have been devised with the best arrangement and form for use, and each one of them is punctual day and night in discharging its function. Think not, that they are lazy or sleeping. If the minds of the intelligent, the science of the learned, and the wisdom of the sage had been united and had been employed since the beginning of the world, in reflection and contrivance, they could not have discovered anything more excellent than the present arrange-

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ment, nor any forms more useful and beautiful. If the eye had been attached to the top of the head, or the ear to the nape of the neck, or the mouth to the back of the body, or if three fingers had been given instead of four, it is plain to a person of intelligence that the existing advantages would not have been secured, and the present beauty of form and appearance would have been imperfect.

Let us notice, also, the daily necessities of man, his need of food, of clothing and of a dwelling; his need of rain, clouds, wind, heat and cold: and that he needs the weaver, the cotton-spinner, the clothier and the fuller to provide him with clothing; and that each one of these has need of so many instruments, and of so many trades, like those of the blacksmith, the farmer, the carpenter, the dyer, and the tanner; and besides, their need of iron, lead, wood and the like. Notice at the same time, the adaptation of these workmen to their instruments, and of the instruments to the trades, and how each art has given rise to several others, and the mind is astonished and distracted. The adaptation of all these instruments comes from the pure grace and perfect mercy of God, and from the fountain of his benevolence. Moreover, God's creating prophets, sending them to us, and leading us to their law and to love them, is a perfume of His universal beneficence. He proclaims himself, "My mercy surpasses my anger," and the Prophet has said: "Verily, God is more full of compassion to his servants, than the affectionate mother to her nursing child."

It has been shown that man from his own existence, knows the existence of his creator, that from his analysis of the materials of which his body is composed and of its distinctive characters he understands the almighty power of God, that from the uses, the arrangement and the combination of his organs, he knows the omniscient wisdom of God, and that his clemency and compassion extend to

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all. He knows, also, that these many mercies and bounties are bestowed upon him without his seeking or care, from God's rich and overflowing grace. Now in this way it is possible that the knowledge of the soul should become the key to the knowledge of God. For just as from a survey of your own being and attributes, you have in a contracted form learned the being and attributes of God, it is also possible to understand how the freedom and the holiness of God, bear a resemblance to the freedom of your soul.

Know, that God exists exempt from and independent of the notions that enter the mind, and the forms that are produced in the imagination, that he is not subjected to reasoning, and time and place cannot be ascribed to him. Still his exercise of power and the manifestation of his glory is not independent of place. But in the same manner, this independence and freedom is possible in your soul. The spirit, for example, which we call heart is exempt from the entrance of fancies and imaginations, and also from size and divisibility. Nor has it form or color, for if it had, it could be seen by the eye, and would enter into the sphere of fancy and imagination, and its beauty or ugliness, its greatness or littleness would be known. If any one ask you about your soul, you may answer, "It exists by the will of God: it has neither quantity or physical quality; it is exempt from being known." Beloved, since you are incapable of knowing the spirit which is in your body, how should it be possible for you to know God, who created spirits, bodies and all things, who is himself foreign to all of them, and who is not of their class and kind? It is one of the most important things, yea, a most necessary duty, to treat of God as holy, independent and free.

How many things there are in your body in reference to which you do not know their reality and essence, such as

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desire, love, misery and pleasure. Their existence is admitted, but their quantity and quality cannot be measured. If you desire to learn the absolute truth about them, you cherish a vain longing; and it is the same, if you desire to know the absolute nature of voice,. nutrition or hearing. As that which is perceived by the eye has no relation to voice, and as that which is perceived by the ear has no relation to form, and as that which is perceived by the sense of smelling has no relation to taste, so that the one can be known by means of the other, in the same manner that which is perceived through the medium of the mind or of divine power, cannot be perceived by the senses. Again, as the spirit exists and controls the body, and yet we know not the mode and essence of it, so God is present in all things, and controls and governs all things, but his form, essence and quality are exempt from being known. Exemption and freedom may be illustrated in still another manner. In the same way that the spirit pervades all the limbs and the body, and the body is entirely subject to its control, and that the spirit is indivisible, while the body is divisible, so also in relation to God, all that exists, springs from him, all creatures exist by his word, and in all possible things his operations are seen, yet still he is not related to place, nor does he reason about anything, and he is free from relation or affinity to any quality of bodies or to quantity.

This topic of exemption and freedom, beloved, cannot be perfectly explained, until the mystery about the soul shall have been developed. The law, however, gives no permission to develop this secret, and it is not lawful to stretch out one's hand to do what the legislator forbids. But the language of his excellency the glory of the world,[1] "God created man in his own image," cannot be explained

[1] Mohammed.

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until the mystery about the nature of the soul or spirit has been explained.

And now, student of the divine mysteries, that you have in general understood, as far as your mind can reach, the being and attributes of God, by having your own soul as an example, it is important that you should become acquainted with the influence of the word, government and sovereignty of God in the world. This is called *knowledge of operation*. You ought to understand, also, as far as reason can go, the government that he exercises over the body, so that you may comprehend in what way creatures obey the word and the will of God, in what way the angels by his decree convey their ministrations from heaven to earth, in what way the movements of the heavens and the revolutions of the constellations are effected, and what is the key to the method by which the orders of dæmons are effected. But unless you know in what way you exercise authority over your body, what probability is there that you can understand how God exercises control over all things.

"Know thyself, and thou shalt know thy Lord." Observe then that when you desire to write upon paper the phrase, *In the name of God*, there arises first of all an inclination and a decision in the heart to write it. Next in order, that inclination and decision by means of the animal spirit is carried to the brain. When that decision has reached the brain then the image of the phrase, *In the name of God* is formed in the faculty of imagination in the brain. Afterwards the image reaches a nerve resembling a white thread, and descends by means of it to the ends of the fingers. Finally by means of the senses the fingers write the phrase *In the name of God*, in the form in which by the will of the heart, it exists in the treasury of the imagination. Again, also, when the will of God is suspended to anything, a token of it rises and appears in

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the empyreal heaven. And there is an essence called both the Spirit of Power, and the Holy Spirit, by means of which it arrives at the throne in the heavens. As the phrase, *In the name of God*, appears in the treasury of the imagination, so the image of the thing dependent on the will of God appears upon the Preserved Tablet. The angels appointed to serve in the empyrean and at the throne, cause it to descend to the inferior world, and by means of the periods and hours of the constellations, it is made to appear through the four elementary qualities — heat, cold, moisture and dryness. As the phrase *In the name of God* is written down by first dipping the pen in the ink, so the thing which God wills, comes to light by mixing heat and cold with water and earth. As paper is so adapted to writing as to preserve the forms which are written upon it, so dryness and moisture are recipient of those other forms and preserve the images that are produced. If moisture did not exist, forms and images could not be preserved. In the same manner as by the will of the heart and by the method above mentioned, the image *In the name of God*, which is in the treasury of the imagination is painted with the pen upon paper, so also the will of God, which is an image produced upon the Preserved Tablet in the empyrean, is produced and made visible in the material world, by means of the angels, the constellations and the elemental qualities of water and earth.

At the time when the heart of man had control over all the organs and members, and they were all obedient to it, some thought that man was a dweller in his own heart. When the empyrean in like manner, ruled over all things by the will of God, they reasoned that man was seated in the empyrean. But like as man has dominion over his own heart in the administration of his kingdom, the body, God also rules over the empyrean in the administration of the affairs of created beings, which he has committed to

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the empyrean. Thus God declares in his holy word, "He sat upon the empyrean to govern the universe."[1] You should know, also, that what we have been maintaining is convincingly established. It is known to men of penetration by revelation.

"God created man in his own image." What does this mean, and how is it known to be true? Know, beloved, that the sovereign recognizes no other person except the sovereign himself. If the Lord had not appointed you to be sovereign over the body as over a kingdom, if he had not confided to you the affairs of its government, and had not given you this brief copy as a model, how would you have been able to comprehend the sovereign, who is independent of reasoning and of place, and who cannot be known by argument or hypothesis or in any other way? Thanks and praises be given to him who is without beginning and eternal, to him who is unceasingly beneficent, to him who made you sovereign over yourself, who subjected your body to you for a kingdom, who made your heart to be an empyreal throne, and made the animal spirit which is the fountain of the heart, to be a seraphic messenger. He appointed the brain to be the throne, and the treasury of the imagination to be the Preserved Tablet. He made the cupola of the brain, which is the source of the nerves and the mine of the faculties, to be like the vault of heaven and the stars. He appointed the fingers and the pen to serve the elemental qualities of nature, and subjected them to your order. He made you more excellent and noble than all other creatures, and to exercise rule over all possible things. He has bidden you to beware and not to be heedless of your soul, which is your kindom and dominion: for to be regardless of your soul, is to be regardless of your Creator and Benefactor.

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[1] S. 10: 3.

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Know, however, that there is an immense distance and wide interval between perceiving the beauty of the Lord, and understanding that which constitutes its soul, marrow and essence. O seeker of the divine mysteries, those impotent astrologers and physicists, who, shut out from the knowledge of God, ascribe changes and events to the stars and to nature, resemble an ant, that seeing a pen making marks upon paper, should be overjoyed and cry out, "I have found out the secret of the effect. It is the pen that causes the marks." This class of men in another point resembles the natural man, who ascribes the influences in nature to heat and cold, water and earth: so a second ant looking on with attention, sees that the pen does not move of itself, but rather by the will of the hand: and he turns and says to the first ant, "You were mistaken; you did not perceive the real nature of the thing: you thought the marks and movements were caused by the pen. It is not so; the whole influence proceeds from the fingers and the pen is subject to the fingers." Beloved, this ant resembles the astrologer, who ascribes effects to the constellations. He does not know that he also is mistaken, and that the stars and the constellations are subject to the angels, and that the angels can do nothing without the command of God.

In the same manner as there is falsity, in the way in which the material world is regarded by the natural man and the astrologer, there is also a diversity of views among those who survey the spiritual world. There are some who, just as they are upon the point of entering upon the vision of the spiritual world, seeing that they discover nothing, descend back to their old sphere. There is also a difference of view between those who do succeed in reaching the spiritual or invisible world by meditation, for some have an immense amount of light veiled from them. Every

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one in the sphere to which he attains, is still veiled with a veil. The light of some is as of a twinkling star. Others see as by the light of the moon. Others are illuminated as if by the world-effulgent sun. To some the invisible world is even perfectly revealed, as we read in the holy word of God: "And thus we caused Abraham to see the heaven and the earth."[1] And hence it is that the prophet says, "There are before God seventy veils of light; if he should unveil them, the light of his countenance would burn everything that came into his presence."[2]

Still the miserable naturalist, who ascribes effects to the influences of nature, speaks correctly. For, if natural causes had no operation, the art of medicine would have been useless, and the holy law would not have allowed to have recourse to medical treatment. The mistake which the naturalist makes, is that he contracts his sphere of vision, and is like the lame ass, that left his load at the first stopping place. He does not know that nature also is subjected to the hand of the power of God, and is a kind of humble servant, such as a shoe is to the ass. The astrologer also says, that the sun is a star, which causes heat and light upon the earth. If there had been no sun, the distinction between day and night would not have existed, and vegetables and grain could not have been produced. The moon also is a star, and if there had been no moon, how many things connected with the requirements of the Law of the Koran, would have been impracticable, such as fasting, alms and pilgrimage, since there would have been no distinction of weeks, months and years. The colors and perfumes of herbs and fruits exist also from its influence. The sun is warm and dry; the moon is cold and moist. Saturn

[1] S. 6: 75.

[2] The author has commented upon this in his work, *Meshkuwet el enwar we masnafat el esrar*. Tr.

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is cold and dry, Venus is warm and moist. And the school of astrologers is to be credited in these representations; but when they ascribe all events to influences proceeding from the heavenly bodies, they are liars. They do not perceive that they all alike are subject to the almighty power of God as God says in his word: "And the sun, moon and stars are subject to his command."[1]. There is also an influence exercised by the stars, which resembles the control, exercised by the nerve that comes from the brain over the finger in writing; while the force of nature is like the control exerted upon the pen by the finger. . . .

When the health of a person undergoes a change, and he becomes the prey of melancholy and suspicion, and the pleasures of the world become distasteful, so that from disgust with it, he withdraws from all society, his physician says, "this person is diseased with melancholy; he must take an infusion of dodder, of thyme and bark of endive as a medicine." The naturalist says: "As this person's malady is of a dry nature, it arises from a predominance of dryness, which has settled on the brain. The occasion of his having a dry temperament is the season of winter. Until spring comes, and dry weather predominates, there is no possibility of a cure." The astrologer says, "this person being under the influence of melancholy, which arises from a hurtful conjunction between Mars and Jupiter, there will be no favorable change in his health until the conjunction of Jupiter with Venus shall have reached the Trine." Now know, beloved, that the language of all these persons is correct, for they all speak and believe according to the degree and reach of their reason and understanding. However, the real and essential cause of the malady may be stated thus. When fortune is favorable to any person, and the Deity desires to guide him into the

[1] S. 16: 12.

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possession of it, he deputes two powerful ministers to that effect, Jupiter and Mars. These in turn, control the light footed ministers, the elements, and command dryness for example to fasten its bridle to the neck of the person, and cause dryness to attack his head and brain. He is thus made to become weary of the world by means of the scourge of melancholy and suspicion, and so with the bridle of the will may be impelled towards the Deity. These circumstances can never be understood in this sense, either by medicine, or by nature, or by the stars. One may, however, learn to understand them by knowledge and the prophetic power combined. For they embrace the whole kingdom of the universe with its deputies and servants, and possess the knowledge of the end for which everything was created: they know to whose command all things are subjected, to what men are invited and what they are forbidden to do.

The Lord invites the servants whom he loves to the contemplation of his glory, at one time by sending misfortune and affliction, and at another by melancholy and sickness: and he says to them, "my servants, what you regard as misfortune and affliction, is but the bridle of my love, by which I draw those whom I love to a spirit of holy submission, and to my Paradise." It is also found in a tradition that "misfortune is first of all the lot of the prophets, then of the saints and then of those who are like them in successive lower degrees. Look not then upon these things as maladies, for they are my favored servants."

O seeker after the divine secrets, now that you have learned that within the body of man, there is a sovereign who possesses and controls it, it is time that you should learn the meaning of the sentences, "Glory to God," "God be praised," "There is no God but God," and "God is the greatest." These sentences are very current on the tongues of men, but they do not know the signification of them.

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Although these four sentences are in appearance very short, yet there are no others that embrace so much of the knowledge of God. Since from the consideration of the freedom and independence of your own spirit, you have learned the freedom and independence of God, you have in consequence learned the meaning and import of the sentence, "Glory to God." Seeing that from the sovereignty which you exercise over your own spirit, you have learned the sovereignty which God exercises, and know that all causes and instruments are subject to his power, and that all outward and inward mercies, which are incalculable and innumerable, are from him, you therefore know the meaning and import of the phrase, "God be praised." As you know also that all things are of his creation, that his government extends over all things, and that without his will no motion or change can affect any thing, you see the meaning of the words, "There is no God but God." Listen now to the explanation of the sentence, "God is the greatest."

Do not suppose that, from all that has hitherto been said, you can understand the greatness of God. His greatness and power are above and beyond the comprehension of the mind and wisdom of man. Moreover the phrase "God is the greatest" does not mean that God is larger than other things: it is a sin to indulge in such a belief. It is as much as to say, that there are large things, but that God is larger than they are. The holy meaning of the phrase "God is the greatest" is that God is so great, that he cannot be known or comprehended by the mind or understanding, or be compared with any thing,—that the knowledge of God cannot be attained by means of the knowledge which a man has of his own soul (which God forbid!), that a knowledge of his attributes cannot be attained from a knowledge of the attributes of man, and that his independence and holiness cannot be compared with the independence and holiness of man in any form whatever. God

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forbid that His sovereignty and government should be compared and measured. The doctors of the law have been allowed however, in the way of illustration to explain in a certain degree the knowledge, power, excellence and sovereignty of God to man, who is frail and weak in understanding.

Thus, let us suppose that a person had been born and brought up in darkness, where he had never seen the rays or light of the sun, but had merely heard a description of the sun. If such a person should ask to have the light and mode of shining of the sun explained to him, how would it be possible in any way to explain to him what it is? If however, there should happen to be in that dark place many glow worms, the person addressed, taking one of them up in his hands, might say, "the light of the sun resembles this," although in reality it has not a particle or an atom of resemblance. Take another example: suppose a child incapable of making distinctions, should inquire of us about the pleasure derived from exercising authority and sovereignty. We, knowing the impossibility of explaining the matter to him, might answer that the pleasure of ruling was like that obtained from playing with nuts or at ball, although it does not resemble them in any particular. From these examples we may learn that it is impossible for any being, except God himself, to know God. "God is witness! God is witness! No one knows God, except God himself."

Finally, seeker after divine mysteries, know that the paths to the knowledge of God, are as numerous as the souls of creatures, and their number is known to God alone. But we have spoken so much as is found above, for the sake of both warning and stimulating the seeker after the knowledge and love of God.

The happiness of man consists in the knowledge, obedience and worship of God. Only a little previously we have

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shown, how it is that man's happiness consists in the knowledge of God. We now proceed to observe, that it is an argument to prove that the happiness of man consists in obedience and devotion, the fact that when a man dies, his destination is to return to where God is. Every thing which concerns man is with God, and his works will all be presented before Him. Whenever all the affairs of a person are in the hands of another, and his employments and his home are with him — when he is near to him and continually has need of him, there will be perfect harmony between the two, and abiding friendship and love. Whoever be the person whom we love, we shall find our happiness with him. There is nothing more delightful than to meet with and look upon an object that we love. But we ought to know that the love of God will never reign in the heart of a man until first the knowledge of God reigns there, and until the remembrance of God becomes unceasing. If one individual love another, he is continually thinking of him, and by this continual remembrance, his love is increased.

The remembrance of God will be predominant in the heart that is always engaged in devotion: and the heart will be engaged in devotion and worship, whenever it withdraws from worldly lusts and sensual pleasures: it will withdraw from worldly lusts, when it refrains from sins. To abstain from sins of rebellion, brings peace to the heart: to be constant in worship, is a means of remembrance of God; and both are a means of growing in the love of God, which is the seed of happiness. And so the Lord speaks in his word: "Blessed is the man who keeps himself pure, who repeats the name of the Lord and prays." [1]

Know also that all our acts cannot be devotional. Those acts only are devotional which harmonize with the law.

[1] S. 84: 14, 15.

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But it is not possible to be totally exempt from sensuous passions, for if the body should be deprived of food and drink for example, it would perish. There is occasion therefore for making distinctions between our acts; but these distinctions, the individual is not capable of making for himself, because the animal soul necessarily casts a veil over the truth and inclines it to vanity. On this account we are obliged to follow after and imitate others — such persons as the prophets. They have been purified and enlightened by the eternal Truth Himself, and have been sent forth to communicate precepts and laws, and to decide upon all circumstances. Every one is therefore bound to imitate them within the limits of the law, and in the regulation of his moral conduct, that he may attain felicity and be preserved from danger of eternal destruction.

Those careless and indifferent persons, O seeker after the divine mysteries, who from ignorance, stupidity and sin have turned away from God and his prophet, and have wandered from the path of religion, may be arranged in seven classes.

To the first class belong those who do not believe in God. They had desired to find him out in his essence and attributes, by speculations and fancies, by comparisons and illustrations. And because they have not succeeded in understanding him, they have referred his acts and his government to the stars and to nature. They have fancied that the soul of man and of other animals, and this wonderful world with its marvellous arrangements came of themselves, and that they are eternal; or that they are effects from natural causes, and that there is no creator beyond the sphere of the world. This class of people resembles the man who seeing a writing, fancies that it was written of itself, and infers that it was not written by a penman or by a supernatural power: or else that it is eternal and that no one knows whence it comes. It is impossible to recover from

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the path of delusion, persons whose ignorance, error and stupidity have reached such a degree as this.

The second class of errorists are those who deny a day of resurrection and assembly. They allege that man and other animals are like vegetables, and do not enter into another body when they die. They say, that a resurrection, in which spirits and bodies shall be reassembled in one place, is impossible, and that there will be neither discipline or punishment, recompense or reward. The errors of this sect arise from their inability to understand of themselves their own souls. They imagine that the spirit is an animal spirit only, and that the heart, which is in reality the spirit of man, is the place for the knowledge of God, and that no evil can happen to it, except that it will be separated from the body. They call this separation, death. This sect is unconcerned about this spirit, and in proof of this we shall discourse, if it please God, in the fourth chapter.

The third class of errorists are those who indeed believe in God and a future life, but whose faith is weak, because they do not understand the requirements of the law. They say that "God is able to do without our worship. There is neither any profit to God from our worship, or any injury done him by our disobedience. If we worship God, we shall learn what good it did in the future world; and if we do not worship him, there will neither be any advantage or harm. God himself so declares in his holy word, "Whosoever keep himself pure, does it for his own advantage," [1] and in another place, "He who does well, does it for his own profit." [2] Although it is better to worship God, yet as God has no need of our worship, therefore if we do not worship him, what harm is there in it?" These ignorant people resemble the sick man, who when the physician says to him, "you should be abstinent, if you wish to be

[1] S. 35: 19. [2] S. 41: 46.

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cured of your malady," should answer, "what advantage is it to you whether I am abstinent or not"? Now though the sick man is right when he says that there is no advantage to the physician from his abstinence, yet if he is not abstinent, he will perish. This class regards obedience and transgression as of the same degree in value. But in the same manner as disease may occasion a man's destruction, so transgression defiles the heart, and will cause it to appear in the future world in a state of woe. And just as abstinence and medicine restore the body to health, so to avoid acts of transgression and sin and to be obedient to God, are means of securing salvation.

The fourth class of men who indulge in error, are those who indeed receive the law, but in some peculiar and erroneous sense. They wrongly say, "The law commands us to keep our hearts pure from pride, envy, hatred, anger and dissimulation. But this is a thing which it is impossible to do. For the soul has been created with these qualities and affections, and human nature cannot be changed. It is just as impossible to make a black material white by scraping it, as for the human heart to be free from these qualities." These ignorant men do not know and understand, that the law does not command that these qualities should be entirely effaced and expelled from the heart, but rather requires that they should be brought under subjection to the heart and the reason, to the end that they may not act presumptuously, go beyond the limits set by the law, and indulge in mortal sins. It is possible even to change these qualities, by doing only what reason requires, and by respecting the restrictions of the law. Many devout men in past times have secured this change of the affections of the soul. These qualities once existed in the prophet of God, but they were corrected, as we learn from the tradition: "I am a man like you. I become angry, as a man becomes angry." And God speaks in his holy word of

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"those who control their wrath, and who pardon the men who offend them." [1] Notice, that in his eternal word, God praises those who dissipate their anger and irritation: he does not praise those who had no anger or rage, since man cannot be without them.

The fifth class of persons in error are those who say that, "God is merciful and ready to pardon, loving and compassionate, and more pitiful to his servants than a father and mother to their children, and therefore he will pardon our faults and cover our transgressions." They do not consider that notwithstanding God is bounteous and merciful, there are still multitudes of poor and miserable people in the world, multitudes who are infirm and helpless, and many who are subjected to suffering. This is a mystery which is known only to God. But it shows us, that though God is disposed to cover and hide sin, still he is an absolute sovereign and an avenger. While he is bounteous and beneficent, he is at the same time dreadful in his chastisements: while he is a benefactor, and provides the necessaries of life, at the same time he who does not seek to gain, obtains no store: and he who is not industrious, accomplishes nothing in the world. Beloved, these ignorant men, in the affairs of the world, in their schemes of living, and in their business, manifest no trust in the bounty of God, nor do they leave off for one moment their buying and selling, their trades or their farming, although God has decreed the means of their existence many years before they were born, and has made himself surety that it should be provided for them. He announces in his eternal word and book of mighty distinctions, that "there is no creature on the earth, for whom God has not taken upon himself to provide nourishment." [2] Still they make not the least exertion in reference to their relations and condition in eter-

[1] S. 3: 128. [2] S. 11: 8.

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nity, but merely rely upon the mercy of God, notwithstanding God declares in his holy word, "man can have nothing without exertion." [1] When they say that God is gracious and merciful, they speak correctly. But they are not aware that Satan is deceiving them with it, hindering them from obedience and worship, and preventing them from engaging in that cultivation and commerce that would prepare them for eternity.

The sixth class who indulge in error, are those who, exalted with pride, think that they have already attained and are perfect: and they say, "we have reached such a state that transgressions do us no harm: we are like the sea, which is not polluted by filth falling into it." These foolish people are so ignorant, that they do not know that "to be like the sea," means to attain such a degree of calm that no wind can put them in movement and that nothing can cause any perturbation in their minds. These persons on the contrary, if an individual fail to treat them with honor and respect, or if in conversation the individual do not address them as, my lord or dear sir, or speak a word that touches their reputation, they bear him a grudge for a long time, and even perhaps attempt to do him an injury. And if a person take a piece of money or a morsel of bread from them, the world becomes too straight for them, and every thing looks dark. These foolish people have not even yet reached manhood. They are weak in their own souls, and are in subjection like slaves to passion and anger. If it were not so, how could they be so inconsiderate and presumptuous? Beloved, the falsehood and error of these people appear from this consideration. When inadvertently any of the prophets fell into sin, even a little and venial sin, they would spend years in mourning and lamentation over it, and occupied themselves in endeavors to obli-

[1] S. 53: 40.

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terate their faults, and to obtain pardon and forgiveness. Filled with fear and dread, they became blind from their tears; from their long continuing perturbation and distraction of mind, you would think they had lost the use of their reason. As for the companions of the prophet, and their immediate successors who were faithful witnesses for the truth and the beloved of God, they were so afraid in their suspiciousness of doing wrong, that they abstained in their anxiety, from doing even what was lawful. Do not these ignoramuses know that their degree of attainment does not equal that of the prophets and apostles, and that they are even at a great distance from them? Why then do they not shrink in fear and awe from the shining vengeance of the glorious God?

If they urge, however, that the transgressions of the prophets were doing them no injury, but that they were exercising prudence and carefulness for the sake of other people, we then reply, that you also ought to be careful, lest other people seeing your actions, should imitate your example. And if they respond, we do not belong to the rank of prophets, that men should walk in our steps, or that any injury should befall us, on account of the sins which they may commit, we would again reply, that it is better that no injury should come to you in consequence of the sins done from imitating you, than that injury should not befall the prophets from the sins done in consequence of imitating them; for they are the praised and accepted servants of God; their earlier and their later sins have been pardoned, and they are blessed in Paradise. Why, then, was it so necessary that they should abstain from forbidden things, from things of a doubtful nature and even from permitted things? It is said that one day some ripe dates were brought to the prophet, and he took one and put it in his blessed mouth. But immediately a doubt entered his mind, as to the manner in which the dates had been obtained,

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and he took it out of his blessed mouth and would not eat it. On another occasion a cup of milk was brought to the faithful witness Aboo Bekir by his slave, and he took it and drank it. After drinking it, he inquired, "where did you get the milk?" The slave said, "I told a man his fortune, and he gave me the milk in return." As soon as the faithful witness heard this, he frowned severely upon his servant, inserted his blessed finger down his mouth, and threw up the whole of the milk, so that none of it remained on his stomach. He then said, "I fear that if any of the milk should remain on my stomach, God would expel knowledge and love from my heart." Now what harm could result to other people from their eating those dates or drinking that milk, that they should have been so careful about such little things? And since they did abstain from such little things, regarding them as injurious, how should it be otherwise than injurious to these foolish people to drink wine, in full bowls and even by the jar full?

They know that the wisdom, piety and abstinence of the prophets and saints were not less than their own. Can there be any more astonishing folly than that of these men who dare to compare themselves with the sea, because they are not disturbed by drinking several bowls of wine, while they compare the prophet of God, to a little water, which is changed in its taste by a single date? They are just worthy that Satan should seize hold of them by the beard and mustachios, and drag them after him both in this world and the next, making them a shame and reproach.

Now the faithful, truthful and experienced in religion, who are mindful that the soul is treacherous, deceptive, perfidious, malicious and false, always watch carefully over their own souls, lest they should do something that transcends the commands of the law, or that is contrary to reason. The soul is always disposed to say to itself, "I am obedient to the truth: I am submissive to the holy law:

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and I am well instructed in knowledge." But thou, without being puffed up by this deceitful language of the soul, must constantly look to all its thoughts and states. If it is walking in the path of the law and of the prophets and saints, it is well! and happy is he that is faithful to his word! But if the soul begin to have an inclination for self-indulgence, to explain away or exceed the limits of the law and to contradict clear and plain knowledge, you must regard it as a machination of the devil and a temptation to the soul. In short, man, until he descends to the grave, must always watch over his soul with attention, to discover in what degree it is obedient to the holy law and in harmony with knowledge. Whoever does not thus watch over and guard himself, is most surely in a delusion and in the way of a just destruction. It is the first step in Islamism, that a man should keep his soul subject to the law.

The seventh form of error, beloved, is that of the class whose mistakes arise from ignorance and carelessness, while they have never heard any thing of these doubts of which we have been speaking. They merely wear the garments, cap and quilted robes of the mystics (soofees), and after learning some of their words and phrases, they pretend to have attained saintship and supernatural powers. And although apparently they have no evil intentions, yet because they do not properly respect the holy law, but practice their devotions in a lax way, their course leads them to corrupt doctrines and errors. They are always inclined to do whatsoever their corrupt disposition would lead them to do, such as yielding to the love of frivolous practices, or to sensual indulgences, or assenting to transgression and sin. In the presence of the multitude, they put on a holy mien and do not approve of error and sin, but they do not withdraw their hearts from the pleasure of wine, nor from adulterous and licentious society, nor withdraw their hands from the business of gaining the world. Although in

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these associations there may be no overt sin, yet they do not consider that such thoughts are but satanic suggestions and sensual importunities. They are not capable of distinguishing actions and circumstances, or right and wrong. Beloved, to this class belong those of whom God declares in his holy word, "We have covered their hearts with more than one envelop, that they may not understand the Koran and we have put deafness upon their ears. Even if thou shouldst call them to the right way, they would never follow it." [1] It is better to talk with a sword, than to talk with this class of people, for they are not open to conviction. . . .

Chapter III.—On Knowledge of the World.

Know, that this world is one stage of our life for eternity. For those who are journeying in the right way, it is the road of religion. It is a market opened in the wilderness, where those who are travelling on their way to God, may collect and prepare provisions for their journey, and depart thence to God, without sorrow or despondency.

Know, that the state previous to death is called the world, because mortality is close at hand. The state after death is called the future, because its rest is permanent. The purpose and design of the world, is to afford an opportunity to make provision for the future, to acquire knowledge, and to worship God. Man as at first created, was destitute of works, and void of perfection: but he was made

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[1] S. 18: 55, 56.

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capable of reaching perfection and attaining felicity, so that while in a material world he could look forward to a spiritual world, understand whence he came, what are his duties, that he is soon to depart, and might be always ready. Man's felicity, which consists in the contemplation of the beauty of God, cannot be vouchsafed to him, until the eye of his judgment is opened. But the eye of judgment is opened by the contemplation of the works of God, and by understanding his almighty power. The contemplation of the works of God is by means of the senses, which become the key to all knowledge of God. The senses subsist by means of the body, and the body is composed of four different elements. Those therefore who are endowed with understanding, conscious of the frailty of their bodies should make all diligence to quit this kingdom of corruption and to enter permanently into the unchanging kingdom.

Know, O inquirer after the divine secrets, that there are two things needful to man in this world; first of all, he needs to acquire spiritual food to preserve his heart from perishing. The aliment of the heart consists in the love and knowledge of God; for whatever is a necessity of the nature of any one, that he loves, as we have before mentioned. The ruin of the soul consists in the predominance of some other love over the love of God, which veils the divine love. Our refuge is in God!

The second thing needful for a man is, that the body should be preserved and tended with care, since it is the frame of the heart. As a camel is to a pilgrim, so the body is like an animal upon which the heart rides. The pilgrim is obliged to give food and water to his camel, and to treat it with attention, that he may reach the end of his journey in safety, and by its means be successful in the object for which he travels. But the attention bestowed by

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the pilgrim upon his camel, should be only in that proportion which is really necessary. If he should be busy with his camel day and night, and should expend all his capital in feeding it, he would not reach his destination, but would ultimately become separated from his caravan, would lose all that he possessed, and in view of the injury he had sustained, he would be the victim of unceasing regrets, and ruin would ensue. Just so is it with man in general. If he pass all his days in attending to the preservation of the body, and spend the capital of his life, in providing food and drink for the body, he will not reach the mansions of felicity, but will wander in the wilderness of destruction, without capital, penniless and a naked vagabond.

Now the body needs in this world three things, one is food, another is clothing, and the third is a home: and by means of these, it can be preserved from injury and ruin. If the food provided for the body is excessive, the body will be destroyed: but let the food provided for the spirit be ever so much, still is it well. On account, therefore, of man's need of clothing and food, God has appointed sensuous desire to act as a commissary, that the animal, that is, the body, may not perish from hunger, cold or heat. But as desire, under the control of the animal soul, would not be satisfied with a sufficient quantity, but would crave to spend its life in eating and drinking, God afterwards committed the animal soul into the charge of the reason, that desire might not transgress the proper limits. Yet as the animal soul and desire, on account of their intimate relations with the body, are so essential to it, their influence would still have been predominant. But God, the holy defender, in accordance with his bounteousness and grace, ("my mercy has surpassed my anger,") has sent his law by the tongues of prophets, that it might become strength to the reason, and prevent the animal soul and desire from

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passing beyond the due limits, and on the contrary might dispose the soul to rest satisfied with the degree of energy and force necessary for it, and by learning the design for which it had come into the world, might spend its days accordingly.

After you have learned, O student of the divine mysteries, what this world in its meaning really is, it is important that you should look at the world in detail. Every thing in the world of matter which grows, has been included under three classes, animal, vegetable and mineral, which are called the three generations or kingdoms. Animals were created some for riding, some for food, and some for tilling. Vegetables were created to afford food and conveniences to man, and sustenance to various animals. Minerals, like gold, silver, copper and iron, were created to serve as instruments to provide means of sustaining life in man. It was designed that by means of these three kingdoms, the spirit of man, while dwelling for a few days in the body, should be employed in making preparation for the future world. Man, however, forgetful of the end for which he had come hither, heedless of the fact that he was soon to depart, and that he would then repent to find that he was going unprepared, became engaged in strife with his fellowsabout the things of the world, fell in love with its ways, and attempted to gain its wealth. In consequence various qualities began to appear in the heart, such as avarice, envy, ambition and hatred, which are sources of its ruin. Finally the heart, forgetful of the duties for the performance of which it had come into the world, exhausted all its energies in building up the world.

As man's primary necessities in the world are three, viz: clothing, food and shelter, so the arts of the world are three, viz: weaving, planting and building. The rest of the arts serve either for the purpose of perfecting the others, or for repairing injuries. Thus the spinner aids the work

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of weaving, the tailor carries out that work to perfection, while the cloth-dresser adds beauty to the work. In the arts, there is need of iron, skins and wood, and for these many instruments are necessary. No person is able to work at all kinds of trades, but by the will of God, upon one is devolved one art and upon another two, and the whole community is made dependent, one member upon the other. When avarice, ambition and covetousness hold sway in the hearts of men, because some are not pleased to see others obtain honors, and because they do not endeavor to quell their wants, envy and hatred arise among them. Each one, dissatisfied with his own rights, plots against the property and honor of his fellows. On this account there was a necessity for three farther distinctions, viz: sovereignty, judicial authority, and jurisprudence, which contains the digest of the law. But alas! poor and wretched man coming under the influence of all these causes, motives and instruments, spends his life in collecting wealth and lays up for himself sources of regret. And just as the pilgrim, who on his way to the Kaaba of Mecca, was engaged day and night in taking care of his camel, got separated from the caravan, and perished in the desert, so those who know not the real nature of the world and its worthlessness, and do not understand that it is the place where seed is sown for eternity, but spend all their thoughts upon it, are certainly fascinated and deceived; as the apostle of God declares. "The world is more enchanting than Harout and Marout: let men beware of it."[1]

After you have learned that the world is delusive, enchanting and treacherous, you need to know in what way its delusions and enchantment operate. I will, therefore, mention some things which are illustrative of the world. The world, beloved, is like an enchanter, who exhibits him-

[1] Teachers of arts of enchantment.

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self to you as though he would dwell with you and would forever be at your side; while in truth this world is always upon the point of being snatched away from you, notwithstanding you are tranquilly unconscious of it. The world is like a shadow, which, while you look at it, seems fixed, although in reality, it is in motion. Life is like a running water, which is always advancing, yet you think that it is still and permanent, and you wish to fix your abode by it. The world again is like an enchanter who performs for you acts of friendship and manifests love for you, for the sake of winning your affections to him: but as soon as he has secured your love, he turns away his face from you and plots to destroy you. . . .

The world resembles those imposters, who decorate themselves externally and conceal the sorrows and curse they bring, while the ignorant, looking only at the outside, are fascinated and deluded. The world resembles the old woman who arrayed herself in silk stuffs and flowered brocades, and with ornaments, and covered her head with a beautiful embroidered veil, so that those who should see her from a distance, and notice only her garments and her form, might be deceived. And whenever she has succeeded in inducing a person to follow after her and to decide upon joining himself to her, she takes off her robes from her back and her veil from her head, and immediately her concealed ugliness is brought to light, and the person who had been seeking her, becomes subject to eternal regret and sorrow. We have received it also by tradition, that the world will be brought to the great assembly at the last day, in the form of a woman with livid eyes, pendent lips, and deformed shape, and all the people will look upon her, (we take refuge in God,) and will exclaim, "what deformed and horrible person is that, whose aspect alone is severe torture to the soul?" And they will be answered. "It was on her account that you were envying and

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hating one another, and were ready to slay one another. It was on her account that you rebelled against God, and debased yourselves to every sort of corruption." And then God will order her to be driven off to hell with her followers and her lovers. . . .

Know, that the world consists of a certain number of stages between the world of spirits and the future world. The first stage is the cradle, and the last is the grave, and every period between these is also a stage. Each month represents a league, each hour a mile, and each breath a step. It is always flowing on like running water. Man in his excessive heedlessness thinking himself to be permanently established, engages in building up the world: and though he has no assurance of a half-hour of time, he makes preparations for dwelling here for many years, and never once brings himself to make the necessary preparation for dislodging and moving to another land.

Behold, another likeness of the world. Know, beloved, that the pleasures of the world, and the pains and tribulations which are the counterpart to these pleasures in the future world, resemble the man who should eat very largely of rich and delicate food and find great delight therein: but on account of his excesses, he suffers from indigestion, his stomach is irritated, vomiting and sickness ensue and he has a great deal to endure before he can recover his health. He repents of what he has been eating, and in proportion as he ate extravagantly, and found enjoyment, he now suffers corresponding pain and disappointment. Now then, in proportion as any one in the world has indulged in the pleasures of life and dissipation, so much the greater will be his anguish and torment at the moment of death. He who possesses gardens and fields, house, lands, and money, servants and horses, will be subject to regret and affliction at death, in proportion to their amount. This misery does not close with death, but on the contrary after-

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wards increases. The Lord Jesus (upon whom be peace!) declares that the world is like the man who drinks sea-water. The more he drinks, the more his internal heat increases. And unless he stops, he will destroy himself by drinking.

Man in this world resembles the guest who was invited to partake of the hospitality of a rich man. In token of respect, the servants set before him silver washing-basins, vessels of costly stones, perfumes of musk and amber with chafing dishes. The poor guest is overjoyed at the sight of these things, thinking that they have been made his own property, and he lays hold of them with the intention of retaining them. The next day, when he is upon the point of departure, they are all taken from him by force, and the measure of his disappointment and regret is clear to every person of discrimination. Seeing that this world is itself a mansion built for travellers, by the road over which they are to pass, that they may make a halt, and lay in provisions preparatory to leaving it again, he is a wise guest who does not lay his hand upon other things than his necessary provisions, lest on the morrow when about to move on, they take them out of his hands, and he expose himself to regret and sorrow.

The people of this world are also like the passengers in a ship, who while sailing upon the sea, arrive at an island. The sailors draw the ship to the shore, and then call out and say, "whoever wishes for water or other provisions, let him leave the ship and go and procure them: let him not delay, for the ship will not remain long. It is besides a dangerous place, and whoever remains here will perish." After receiving this warning, the passengers leave the ship, and are all scattered about, one in this direction and another in that. The wise passengers, remembering the admonition of the sailors, attended quickly to their affairs, and immediately

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returned to the ship. They selected the places in the ship that pleased them best, and sat down calm and tranquil. Some of the passengers, however, gazed at the trees, the flowers and the fruits of the island, listened to and admired the notes of the birds, and became absorbed in looking at the wonderful curiosities found there. They delayed so long, that when they came to the ship, they found every place in the ship occupied, and no room for them to sit down. They finally entered, and found a corner with great difficulty, where they could just press themselves in. Others, not satisfied with gazing around, loaded themselves with stones that had the appearance of being precious, and after a time returned to the ship. They found it completely full, and absolutely no place to sit down. After they had entered, they were compelled from necessity to stow themselves in a dark place at the bottom. As for the stones which they had thought were jewels, they lost their color, putrefied, and sent forth such a disagreeable odor, as to affect the passengers to nausea. It was impossible to expel the odor and they remained to the last with its disagreeableness in the midst of them. Others still took so much pleasure in looking about the island, that they said to themselves, "where shall we be able to find a more delightful retreat than this? It is not clear that the place where we are going is better than this." And so they chose to remain there; and after the departure of the ship some of them perished with hunger and thirst, and some were devoured by wild beasts. Not one of them was saved. In the future world they will certainly suffer pain and retribution.

Do not suppose, beloved, that every thing in the world is to be despised; for there are some things that are estimable and valuable, which belong to the world: viz: knowledge, worship, war in defence of the faith, and abstinence: and also a sufficiency of food, drink and clothing, marriage,

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domestic shelter and other things; seeing that they are helps on the journey to the future world and in the path of knowledge, they are all of them exceedingly important and necessary. Delight in knowledge, delight in worship, delight in prayer and delight in communion with God are things of this world, but still they are for the sake of the future world. It follows, therefore, that the pleasures of the world are not all of them blamable, but only those which entail punishment in the future world, or which are not in the path to paradise, and so the apostle declares, "The world is a curse and all that is in it is a curse, except the remembrance of God and that which is the object of his love."

Chapter IV.—On Knowledge of the Future World.

Know, beloved, that we cannot understand the future world, until we know what death is: and we cannot know what death is, until we know what life is: nor can we understand what life is, until we know what the spirit is. . . .

If you wish, O student of the mysteries of God, to learn the essential facts about death, you must know that there are in man two kinds of spirit, one of which is of the nature of the spirit in animals and which we call animal spirit, and the other is of the nature of the spirit of angels, which we call human spirit. The fountain of the animal spirit is in that heart which is in the left side of the breast, and is a piece of flesh. It is a delicate exhalation from the humors within the animal. Its constitution is fixed in certain

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proportions, just as is that of oxymel, which is composed of honey and vinegar that on being mixed, while they lose their own flavor, acquire a new, delicate and useful flavor, so also, by the blending of the various elements of the body, a delicate exhalation is the result, which finds its home in the heart. It gains other delicate qualities from the heart, and from thence the blood channels, which are the veins of pulsation, are supplied. The exhalation passes by their means to the brain and from thence flows to all the members. It is exceedingly hot, but in its passage to the brain, it loses some of its heat and becomes tepid. By the distribution of this spirit through the body, the eye sees, the ear hears, the tongue tastes, the nose smells, and the rest of the organs are endowed with their proper movements and perform their appropriate functions. . . .

So long as the spirit works in equilibrium, it is capable of delicate operations and effects; but so soon as excess of heat or cold destroys the equilibrium, the exhaled fluid is diminished, and it becomes incapable of movement and sensation. . . .

That cause which throws the constitution out of balance and occasions the complete absence of the exhalation, is called the Angel of death, who is also a creature of God. Most persons merely know his name. . . .

The second kind of spirit, which is called both human spirit and heart, is not a body, and is not susceptible of division. It is the seat of the knowledge of God. In the same manner, God himself is one, is not susceptible of separation into parts and the place of his knowledge is one. . . .

Even if the action of the larger part of the members should be paralyzed, it is still possible that life should continue in a man. Death occurs, when, after the ruin of the constitution, the delicate exhalation on that very account is no longer transmitted to the members, and they are all

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paralyzed together and cease from movement. Although you still remain in being, you possess neither sensation nor motion. You know, also, that in infancy the ingredients of your body were drawn from pure blood. These underwent a change and disappeared, and the ingredients derived from food took their place. You know moreover that the form which you had on your entrance into the world, and your present form are not the same. It follows therefore that there is no necessity of your perishing on account of the perishing of the body. The body is earth and must therefore return to its original earth. Your spirit, however, is of an angelic nature, and you must therefore mingle with your original spirit. If the influences of the world operate with such power that you are separated from your original spirit, it is fixed and sure that you will have to endure the torment of separation and misery.

It should be kept in mind, that you possess two classes of qualities or attributes. One class includes those which result from the union existing between your body and your spirit, viz: hunger, thirst, sleep, eating and drinking. These qualities become useless at death. The other class includes qualities belonging solely to your spirit, such as the knowledge of God, and the love of God, and the qualities which tend to secure these two, as gratitude, submission and supplication. These are qualities of your individual self, which do not pass away with death, but on the contrary the fruits of them will be ever growing and developing. The language of the blessed God in the words, "the permanent things are the holy virtues"[1] points to these qualities. That spirit is also enduring and eternal, which is destitute of love and knowledge, which indeed knows nothing and has no delight in or affection for these

[1] S. 18: 44.

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things, but it will be blind and wretched: as God declares in his word: "He who was blind in this world will be blind in the future world, and in a most fatal path of error."[1]

The nature of death cannot be understood, unless we are acquainted with these two kinds of spirit and with the relations of dependence between them. Know, then, O seeker, that the animal spirit belongs to the inferior world. The elements of its four humors, blood, phlegm, bile and black bile, are fire, air, water and earth. The animal spirit is a product of a delicate exhalation from these elements. The variations in the measure of a man's health depend on the variations of heat, cold, dryness and moisture. Hence it is the object of the science of medicine to preserve these four elements in their due proportions, so that they may serve as instruments to secure perfection to the human spirit.[2]

The human spirit belongs to the superior world and is of an angelic substance. It has come into this world a stranger, and has descended from its original state to this temporary home, to receive its destiny from divine direction, and for the purpose of acquiring the knowledge of God. In accordance with this, God declares in his holy word, "We said to them — leave paradise all of you just as you are: a book destined for your guidance will come to you from me: fear shall never befall those who will follow it, and they shall not be afflicted."[3] And that which God says in another place, points to the different degrees of worlds: "I create man of clay: and when I shall have formed man of clay and shall have breathed my spirit in him, prostrate yourselves before him in adoration."[4] First of all in his saying "from clay" he points to a material body. The phrase "I shall have formed" indicates the animal spirit. The phrase "shall have breathed my spirit

[1] S. 17: 74. [2] See Good's Physiol. Proem [3] S. 2: 36. [4] S. 15: 28, 29.

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in him," means that I have given to the body of man a well balanced constitution with power and motion. I have made it capable of receiving the law, and to be a home for the knowledge of God.

In the same manner as the equilibrium of the inferior spirit is to be preserved by the science of medicine, the equilibrium of the human spirit is to be preserved by virtue, self-denial and holy zeal, that it may not be destitute of the love of God and perish.

It is plain, then, that a knowledge of the future world cannot be acquired, until we have learned the true nature of the two spirits. We cannot obtain, for example, a knowledge of God, unless we previously possess a knowledge of the soul. But as Islamism consists essentially in believing and confessing the Lord God and the future world, it becomes our duty to acquire a knowledge of the future world as far as the thing is possible. There is, however, a mystery regarding the future world, which the holy law has not authorized to be explained or to be mentioned, because it could not possibly be understood. Seeing then that the knowledge of the future world cannot possibly be acquired, until that mystery is revealed, strive that it may be revealed in your own soul by pious endeavor, self-denial and divine guidance. You cannot learn it by any possible efforts from any other person by the hearing of the ear. Many persons have heard this mystery, which represents one of the attributes of God, but they did not acknowledge it as true, and said that it was impossible, not because it was in its nature exempt from being known, but because it was an unemployed mystery. It is not named either in the Koran or in the Traditions. God commanded the prophets not to inform the people of the essence of his attributes, saying "for they will not understand them, will accuse you of falsehood, and will do injury to themselves."

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It has been clearly shown to you, student of the mysteries, that the human spirit in its essence and attributes is to live forever, and that it is able to exist without a frame, that the meaning of death is not the annihilation of the spirit, but its separation from the body, and that the resurrection and day of assembly do not mean a return to a new existence after annihilation, but the bestowal of a new form or frame to the spirit, which shall be under its control in the second period, as the body was under its control in the first period. . . .

In saying that in the second period, the control of the spirit is easy, it is said in respect to our contracted understandings, and in comparison with our operations, and to make the matter intelligible to others. When God says in the powerful Koran, "It is easier," and "For me it is easy," he uses the phraseology only for the sake of being understood by man. On the contrary in the first period, there was nothing difficult for God: it would have been nothing to him to have created without matter, in a moment, a thousand worlds like this which we inhabit.

It follows from what has been said, that it is not a necessary condition of the resurrection and restoration that the spirit should possess exactly the original mould. For that which we seek is not the vehicle of the spirit, but the spirit itself. This mould undergoes change even in this world. Thus, for example, the materials derived from the condensation of the exhalations and the inspissation of the blood in the stomach of the mother are changed by food, and new flesh is produced. Many questions may be asked of those who say that the identical mould must return and rise in the resurrection, and that its absence can in no wise be tolerated, and they will find much difficulty in answering them. One may ask for example, if one man eat another man, and the man eaten become a portion

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of the man who ate him, will that portion rise with the eater or with the man who was eaten? . . .

They say, moreover, that man is created from seed, that seed is derived from food, and that food is derived from the milk, the fat or the flesh of an animal: now with which of all these will the ingredient rise up? Again, suppose the hand of a thief has been cut off, and he afterwards leads a life of good works and enters Paradise. Must he enter Paradise, where nothing maimed or defective can enter, without his hand, or will he enter with his hand, notwithstanding his good works were not performed when he possessed that hand? The source of all these perverse speculations is in the pretence of those who say that in the day of assembly, the mould reäppears and that the spirit follows in its train, that if it was not for the mould there would be no semblance of man, and that the permanency of the spirit results from its connection with the body.

If, O seeker, you say that the well known language of the wise in the law and in discourse is, that at death a man becomes non-existent, and that he exists afterwards in the resurrection with this identical body, and that our language contradicts theirs, we reply. He who merely follows in the track of the language used by others, will never acquire a knowledge of the truth. However, the words you have cited are not those, either of people of intelligence or of imitators. For the intelligent and learned know that the body is not annihilated at death, but that the materials of which it is composed are separated, and that it is this separation which they call death. The imitator has likewise heard from the doctors of the law, that the spirit lives eternally after death.

It is well known that spirits are divided into two classes, in one of which all blessed spirits are embraced and in the other all miserable spirits. With respect to the blessed spirits God says, "Think not that those who have been slain on

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the divine road are dead: they are alive near their Lord and are sustained by him."[1] In regard to the miserable spirits, the apostle of God came to the infidels who had been slain in the battle of Bader,[2] and called upon each by name, and said, "O! such a one, son of such a one, I have found the victory and triumph which my Lord promised. And you, have you found that latter end and torment of which the Lord assured you, or have you not found it?" His honored companions having remarked to him, "they are dead and how can they hear and how can they speak?", the glory of the world replied, "By the truth of God who has commissioned me to be a true prophet, they are better able to hear than yourselves: there is only this difference, that they are not able to answer." And the prophet of God declared that the spirits of martyrs are in lanterns under the empyrean: and according to another account that they are suspended to the fruits of the trees of Paradise in the craws of green birds. In brief, whoever will study carefully the verses of the Koran, the Traditions and recollections that have reached us respecting death, and will consider the well substantiated accounts of the movements of the dead in grave yards, he will know, in a manner that should remove all doubt, that the dead clearly do not become non-existent. . . .

Hence it happens, that when a person becomes breathless and is entranced, as sometimes happens in the first exercises among the Soofees, he has a delightful vision of the state after death, notwithstanding the animal spirit continues in the enjoyment of health. Yet if, while in that state, fear and terror should happen to predominate and deprive him of feeling and motion, and if he become so far like the dead that he perceives no external object, the same

[1] S. 3: 163.

[2] First victory of the Mussulmans near Medina.

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things may be revealed to him which are revealed to others after death. It is sometimes permitted, after he returns from that state to the sensible world, that all he has seen should remain in his memory, or that if he does not remember it, traces of it should remain in his mind. If he saw hell, he will retain traces of despondency, sadness, heaviness of spirit, suspicion and melancholy. If in the treasury of his imagination he has preserved these traces, it is lawful for him to communicate them to others. . . .

The torments of the grave, O seeker after the divine mysteries, are of two kinds: one kind is spiritual and the other is material torment, and they have been repeatedly explained.

The spiritual torment cannot be understood, until a person is acquainted with his own soul and spirit. His soul exists in its own individuality: it is not dependent upon form or mould: it has neither hand or foot, nor eye or ear. The external senses which it possessed were dependent on the body, and remain inactive and useless after death, and all the enjoyments resulting from them become entirely null. Wife, children, friends, property, slaves and domestics, equipage, cattle, estates and fields were formerly sources of enjoyment to it. And if he were a lover of, and a seeker after these things, so that he had been always occupied with them, the torment of separation from them will make a deep impression upon his soul, and he will be most certainly the subject of sorrow and lamentation. But if his heart was untrammeled by these delights, and was inclined towards the future world and was always awaiting death, if the enjoyments of the world were distasteful to him, while he was always occupied with the wants of the soul, which are to find out God — then, in the event of death, he will have attained his longing and his love, and have reached rest, joy and happiness.

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Call to mind now, that the spirit of a man is eternal: it has not perished at death. Can you doubt then, that that spirit which had chosen the glare and glitter of the world for its beloved object, and had been absorbed heart and soul in the occupations of the world — when in a moment of time, all that which it had been gaining day after day, which it had obtained with great perseverance and industry, and which it had been coveting and striving for during many years, is taken out of its hands by death, can you doubt that it will be the prey of endless sorrow and grief, of abundant mortification, regret and remorse? This accords with what the apostle of God declares, "Love what thou hast loved: but thou shalt be separated from it." But when a man realizes that this world is a stage of a journey, and that the purpose of his coming hither is to attain the knowledge and love of God, and when he is day and night occupied with this, forsaking the world before death arrives, and perhaps even envying and longing for death, there can be no doubt that in the event of death, he is delivered from all pain and sorrow, and obtains rest and spiritual union.

From what has been said, it follows that the torments of the grave are for the friends of this world and the seekers of the world, and not for the devout and pious. And here we find an explanation of what the prophet of God said: that "the world is the prison of the believer and the paradise of the infidel."

Since you have now learned, O student, that the torment of the grave is occasioned by love of the world, know also that there are different degrees of it. It is in proportion to each person's affection and love for the world, and will come upon some with great severity. . . .

If, for example, a person possess a female slave to whom he is exceedingly attached, and on account of his being every day by her side, he is not conscious of his attach-

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ment, and then if suddenly he should become offended with her and sell her to another person, and should afterwards become conscious of his concealed love, his heart would hourly assail him and sting him like a serpent. The fire of regret and rage would burn within him, so that he might be not only sick from its effects, but might even die. Now if it is possible that such results should follow from the loss of a female slave, consider what must be the degree of grief and affliction of a man who is suddenly called upon to part with all his beloved objects in a moment. Just as it might happen that the master of the female slave should throw himself into the water to drown himself, or cast himself into the fire to burn himself, all on account of his separation from her, so those spirits of men who are in their graves utter many wishes, exclaiming, "Ah! would that these scorpions and serpents, like those in the material world, would only sting us and destroy us, that at least we might be delivered from this torment."

Pain in the world is an accident of the body, and passes from the body to the spirit, and thus the spirit participates in the torment. But in the future world, pain has its home in the spirit itself, and hence it is excruciating.

Every one bears away from this world within himself the essence of his torment, but men are not aware of it. God says in his eternal word, "Ah! if you knew by infallible knowledge, you would see hell, you would see it with the eyes of certainty,"[1] and again He says in another place in the glorious Koran, "Truly hell encompasseth the infidels."[2] He does not say, *it shall encompass*, but rather that it already surrounds them. . . .

If you say, O student of the mysteries, that "the torments of the grave are occasioned by the relations arising from this present world, from which no one can be exempt,

[1] S. 102 : 7.
[2] S. 9 : 49.

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since every one has either children, a house, horses or servants, and that it results, without doubt, in causing a feeling of dependence upon them: and hence, no person will be able to escape the torments of the grave," we observe, in reply, that what you say is correct, but then there are persons who have no relations of dependence upon the world, and who always desire death from the Lord God. The prophets themselves did not pass away from the world until they longed for death. You should know also, that the rich who are attached to this world are of two classes. One class includes those, who although they have a love for the world, yet they love the blessed God more. An illustration of the character of men of this class, may be found in the man who owns a house in each of two cities; while living in one of them he has no longing to remove to the other. But it happens that an office is conferred upon him in that other city, and immediately he is overjoyed, and is eager to go there, and makes every preparation to remove thither and to forsake his first house. His longing for an office, leads him to move, and takes away all desire of remaining where he was previously. Now although men of this class have an inclination to the world, yet as on the other side the love of God preponderates, they prefer to go to the future world, and would not indeed, if it were possible to do otherwise, remain here a day. When persons of this class die, whose affections preponderate towards the other world, they do not experience the torments of the grave.

The other class, beloved, includes those who are entirely absorbed in the love of the world, and of pleasure. This class cannot escape from the torments of the grave, as the Lord in his everlasting word declares: "There are none of you who will not be precipitated."[1] But some of this class occasionally have a leaning towards eternal truth, especially

[1] S. 19: 72.

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if there is any trace of the love of God remaining in their hearts, and when they are about to leave the world, they forget it and never more yearn towards it. In that case they also are saved from the tribulations of the grave. A picture of this class is found in the person who also has a house in each of two cities, and as long as he is living in the one, he has no longings for the other. But at last some necessity compels him to quit his first house, and to go and reside in the second. After a few days residence, the love he had for the first house dies away from his heart and it appears better to him not to return thither. This class suffer torment in the grave up to the point where they forget the world, but after familiarizing themselves with the mansions of the future world, they are freed from their pain. Those, however, whose hearts were immersed in the pleasures and cares of the world, and whose hearts bore no trace of the love of God, or of thoughtfulness for the future world, and who preferred this world to the other, will never be delivered from torment.

There is not a person in the world who will admit that he does not love God, or but that will pretend that he does love God. But this pretention can be brought to a touchstone and standard and found out by experiment. Just look at his actions and conduct, and see whether he will do a thing which has the holy approbation of God, or whether he will abstain from doing a thing which has not the divine approbation, notwithstanding the strong opposing inclinations of his soul, and thus show his reverence for the Holy Law. If he does thus oppose the desires of his soul, he is correct when he affirms, "I love God." But if he is following the inclinations of his soul, and is only saying with his tongue that he loves God, his declaration is a lie. When a person in this state of mind utters the confession, "There is no God but God," a voice from God addresses him saying, "You are a liar, for your actions

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are opposed to your words." In this state of mind there is no use in making the declaration, "I love God." The prophet of God says however, that it is not an idle act to utter the phrase "There is no God but God" for the sake of preserving a man from the divine vengeance, so long as the man is one who does not prefer worldly works to the works of the future world. . . .

Let those, then, who wish to be saved from the torments of the grave, be earnest in cutting off the ties of the world; and let them acquire a habit of being satisfied with just that which is of actual necessity. Be satisfied for example with that amount of food and drink which is necessary to give strength for devotional exercises; be satisfied with the amount of clothing necessary to protect the body from cold and heat; and so in everything else. If a man cannot purify his heart from attachment to the world let him at least be assiduous in devotion and in calling upon God, and show a preference for cultivating an intimacy with the love of God. Let him look with fear and dread upon trust in the world, and weaken and relax the demands of sense by strict obedience to the law. If notwithstanding he should prefer to yield to the animal soul and to trust in this world, let him prepare himself to experience the torment of the grave and the terrors of the future world. And may the grace and mercy of God which embrace all men, and his pardon and forgiveness which extend to rich and poor, to great and small, reach and save him!

The *material torments* of the grave, O seeker after the divine mysteries, are those which are addressed to the body and through the body to the spirit. *Spiritual* torments are those which reach the spirit only. The language of God, "It is the fire of God, the lighted fire which shall reach the hearts of the reprobates," refers to spiritual torments which affect the heart. The spiritual hell then is of three kinds. The first is the fire of separation from the

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lusts of the world; the second is the fire of shame, ignominy and reproach; and the third is the fire of exclusion from the beauty of the one Lord. These fires only burn the soul and do not touch the body.

There is in the world a cause or source of each kind of torment. Then let us examine the cause of the fire of separation from the lusts of the world. In explaining previously the torments of the grave, we said that they arose from love of the world. Love and desire constitute the Paradise of the heart. So long as the heart is with its beloved object, it is in paradise, and as soon as the heart is separated from its beloved object, it is in hell. The men of this world, by their supreme love of the world, have made it to be their beloved object, and as long as they are in the world it is a real paradise to them; but as soon as death comes and separates them from their beloved, their state is a real hell to them. Believers, by loving God and the future world, have made them their best beloved, and as long as they are separated from them they are in hell. But as soon as this separation is annihilated, and they leave this world and go to the other, having attained their chief purpose and desire, they are in paradise in reality.

Suppose a person, a prince, had been passing his life in banqueting and pleasure, and every one around him had been submissive and obedient to his orders. But an enemy comes and deprives him of his principality, enslaves his wife and servants, and they plunder him of his money and property before his eyes. His pearls and jewels are wasted upon trifles, and his beautiful studs of horses and his retinue are dispersed. He becomes a subject in his own city, is compelled to wear coarse clothing in the presence of his former servants, and is appointed to guard and feed the dogs. Can you in any wise appreciate the misfortune into which the prince has fallen, and how deeply he must be a prey to anguish? Probably he exclaims many times in a

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day, "Would rather that I had fallen into the abyss of the earth and perished!" The severity of his torture is in proportion to the amount of sensual enjoyments in which he had participated while he was a prince. And it is plain that this torture is not inflicted on the body, but upon only the spirit, and that it is more excruciating than any pains of the body would be.

So long as a man is attached to the things of this world engrossed with the care of his body, and gives over his nature to intercourse with sensual enjoyments, he will not care for the warnings his spirit receives in this world, nor for the torment that it will incur in the future world. A sick man for example will not be so excessively despondent about his malady in the day time, because his senses are interested in other things, and as his heart follows in their train, he in some measure forgets his malady. In the night, however, when his senses have nothing to be employed about, his thoughts about his malady do not leave his mind free for one moment, and his pain increases. So also in death, the cares and thoughts of the world and the external senses cease entirely to operate on account of the torment of the spirit, and then the perfect torment of the spirit becomes manifest.

The second kind of torment in hell, beloved, is the fire of ignominy and shame. In illustration of this, suppose that a prince receives into his friendship a poor and humble man, treating him with great honor and making him the favorite among all his confidential servants. He gives into his hands the keys of all his treasuries, commits his honor and wife and family to his care, and in short confides all his affairs into his hands, in full reliance upon him. Then, suppose that the poor man, after being elevated to this high rank, should be puffed up with pride, and should be disposed to betray the honor of the prince,— that he should begin to indulge in unworthy conduct with his wife

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and servants, and should open his coffers and spend his property for his own pleasures. Suppose farther that he should even be consulting with the prince's enemy who has designs upon the principality, and should enter into a compact with him. Just at this point the prince from a concealed retreat espies his conduct in his family, and learns how he has wasted his money and his possessions, and in short becomes acquainted with everything he has done. The man also learns that for some time the prince has been aware of his course of conduct, but that the reason of his delaying and postponing punishment was that he might see what other crimes he would commit, that he might punish him accordingly. In these circumstances the reflecting can easily appreciate what would be the confusion and mortification of this individual. He would think it a thousand times better to fall from a precipice and be dashed to pieces, or that the earth should open and he sink into the abyss, than that he should continue to live. So also is it with you. How many actions you perform, of which you say, "it is in private and no one sees it," or of which Satan cloaks over the guilt from your mind, by persuading you that it is all right and fair. But at last, when death comes and makes your sin manifest, then the fire of ignominy and shame makes you captive to fierce torments and long continued misery. . . .

Suppose you should throw a stone over against a wall, and some one should come and inform you that the stone had hit your own house, and had put out the eye of your son. When you rush to your house and find that it is even so, can you conceive of the fire of repentance and anguish you will have to meet? . . .

Nor can the overwhelming nature of the remorse or the pain of the punishment be compared with the pain of putting out your son's eye, because the former is eternal. The pains and sorrows of the world are but for a few days

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and then pass away, while thoughts upon the advantage and profit in the future world of pains endured here, will bring joy to those who reflect upon them. Your happiness does not depend upon your son's eye nor upon your own eye, but upon being accepted of God, and being honored and enriched with a vision of the divine beauty and excellence.

Another illustration of the fire of shame and ignominy is, to suppose that a prince is giving his son in marriage, and that after many days spent in feasting and rejoicing on the occasion the moment has come for the son to receive his bride. The son, however, has secretly withdrawn with some of his friends and become so intoxicated as to be incapable of reasoning. But at last he concludes that it is time for him to return, and that he will go secretly and alone. He sets out, therefore, on his return home, out of his mind and unconscious of what he is about. He walks on until he reaches a door through which he sees lights burning. He fancies that it is his own house, and straightway he enters in. He looks around and observes that there is not the least movement, not even a breath, but that all have gone to sleep. At last in the middle of the court he sees some one covered over with damask silks and brocades, from whose body is exhaled the odor of musk. He fancies and exclaims that this must be his lawful bride, and he kneels down before her and kisses her lips. He observes that his mouth is damp with moisture that exudes from her lips, and that he is touching something wet. The mouth of his beloved is wounded and bloody, and he thinks that it is rose water, and continues to caress her, till he is stupified with sleep. After a while he awakes and comes into his right mind, and perceives that he is in a sepulchral chapel of the fire-worshippers, and that what he had embraced was nothing but the body of an old woman ninety years old, who had died six months

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previously. On that night they had anew changed the coverings, burned incense and lighted the candles.[1]

When the prince's son sees himself in this condition, shame and mortification overwhelm him to such a degree, that he is upon the point of destroying himself. But still severer anguish lays hold of him, lest, when he should leave the place in this filthy state, he should be seen by some person. While he is asking himself what he should do, his father who knew nothing as to the place where his son had been, but who had left his palace with his friends and his suite in search of his son, meets him just at the moment he is coming out of that house in that state. Imagine now the shame of the son and what must be his feelings. No doubt but that he would have given his life to any one who could have offered him a refuge and deliverance from his shame. You see that the torment here is spiritual and not material; for there is not an iota of pain here that affected the body.

In like manner the men of this world when they go to their graves, will see that what they called pleasure was flesh and corruption which they had unlawfully taken into their mouths. They will see that that beloved object, dressed in rich clothing, obtained by illicit means and stained with pollution, is but the old hag the world, with her disgusting face and horrid smell and putrefied corruption, on account of whom so many drowned in illusions have become victims to shame and remorse. Still more bitter torment will that be, beloved, which will be the lot of man, when in the day of resurrection and assembly all these crimes and sins shall be laid open before all the angels and prophets. Our refuge is in God!

Think not that the shame and remorse of the future world is only of the kind that we have been describing.

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[1] The fire-worshippers did not bury their dead.

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For we have before said that nothing belonging to the future world can be understood in the present world, or be rightly conceived of by our minds. The doctors of the law however (upon whom may God show mercy!), for the sake of warning and admonition in the world, and so far as the mind can appreciate it, have spoken in parables and illustrations, and they have in various ways compared the ignominy and remorse of the future world to the shame and misery existing in the present world, notwithstanding the misery in this world is but for a moment or a few days, while the other is everlasting.

We come now, beloved, to the third fire, the fire of separation from the divine beauty, and of despair of attaining everlasting felicity. The cause of this fire, is that conduct and stupidity which led the individual, while in the world, not to acquire a knowledge of God, to neglect purifying the mirror of his heart from the consuming cares of the world and from the rust of sensual pleasures, and to omit those austerities and exertions by which his blamable inclinations and dispositions might be changed to laudable ones. The individual did not act in accordance with the tradition which says, "Acquire a character resembling the character of God," and by means of which he might have been worthy of the vision of the beauty of the Lord, and of being received at the king's court. The heart which is full of the love of the world, and of the rust of worldly cares and transgressions, will see nothing in the future world, must be shut out from all kinds of felicity and will rise blind at the resurrection. Our refuge is in God!

An illustration of this fire of reprobation and banishment may be found in this world, by supposing that a company travelling by night should come into a valley that was very stony, and as they went on their way, they should hear a voice calling out, "Take good heed and carry away with you an abundance of these stones; you

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will have occasion to use them at some future time." Some of those who heard the voice, exercised prudence, and carried off as many stones as they could; others for the sake of saving themselves trouble, carried off only a few. Others still, did not carry away any, saying, "it is folly to take pains and trouble for the sake of an advantage that is future and prospective: indeed it is not clear that there will be any advantage at all." Besides, they treated as stupid and foolish those who did carry any away, and said, "look at those insane people, who, from pure cupidity and craving for what is impossible, load themselves down like asses, and give themselves useless pains. We are the comfortable ones, who go on our way free, joyful and without concern for the future." When the light of day dawned, they saw that all the stones were invaluable rubies and sapphires, each one of which was worth at least three thousand drachms of silver. Then those who had brought away stones, exclaimed, "alas! that we were not able to bring away any more." But those who had brought away nothing and had traveled with comfort and ease, were overwhelmed with the fire of reprobation; they strike their heads upon the ground with the energy of remorse, and are filled with sighs and lamentations. Those who had brought away stones, arrived at the city whither they had been going, and bought estates and slaves, jewels and rich and pleasant eatables and all kinds of raiment, and gave themselves up to banqueting and enjoyment, while those who had not brought away any stones, became so hungry, destitute and naked, that they went about desiring to perform for them some kind of service. But when they begged of them either food or drink, they said, in accordance with what God says in his ancient word. "The dwellers in fire shall call out to the inhabitants of Paradise, 'pour out upon us a little of your water and of the enjoyments God has bestowed upon you.'" They will answer, "God has forbidden

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the unbelievers either."[1] "No, we shall give you nothing, for God has prohibited you from having anything. Yesterday you were laughing at us, to-day we laugh at you: as God declares in his eternal word, 'If you mock at us, we will in our turn mock at you, as ye have mocked at us.'"[2]

This illustration of the enjoyments of Paradise has been made in very brief and comprehensive language, to serve as an example, but it is impossible by any similitude to give an idea of what it is to be separated from the contemplation of the beauty of the Lord. For whoever has but once experienced the delight of being near to God, and has enjoyed the vision of the beauty of the Lord, would perish if he should be for one moment separated from it. Even the last and least person who quits hell will receive a mansion from the Lord God which is equal to ten of these worlds. But we do not mean to say ten worlds in surface or in amount by number and weight, but ten worlds in value and in the beauty they display and the pleasure they afford.

Having now become acquainted with the three kinds of spiritual torment, know, O student of the divine mysteries, that these spiritual fires of which we have been speaking, are more severe than the fires which burn the body. The body does not itself perceive pain, and until pain reaches from the body to the spirit, it does not make a trace or impression. If, then, the anguish that is occasioned to the spirit through the channel of the body is so agonizing, imagine how intense must burn the fire of that anguish which has its origin in the centre of the soul. The pain which any thing suffers is occasioned by the excess of something contrary to the nature and necessities of its constitution.

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[1] S. 7: 48.
[2] S. 11: 40.

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The necessities of the constitution of the spirit are to know God and to contemplate his beauty and excellence. But if stupidity and blindness, which are opposed to this tendency of the spirit, become predominant, the soul will be vexed and tormented, and there will be no end to the torment. If it were not that the body is subject to maladies in the world, the fact of this blindness and stupidity would have been visible and apparent to the soul in this world also, and it would also have been the source of immense anguish, and torment would at no moment have ceased to afflict men. Just as when a person has a severe sore upon the hand or foot, if besides it should be cut with a knife or fire should be put upon it, he would not feel the pain of the knife or the fire, on account of the pain of the sore, so likewise the maladies of the body, such as hunger and thirst, or such maladies as love of possessions and family, combined with the absorbed attention of the senses to these things, prevent the soul from being conscious of its disquiet and distress. But when in death, the torment to which the body was subject is taken away, it will be seen how excruciating is the torment of the soul. And thus also God announces in his holy word: "Ah! if you knew it with infallible assurance. But you will see hell: you will see it with the eyes of certainty."[1]

You should know, O inquirer, that the many arguments we have adduced to prove that spiritual torment is more severe than material torment, and the many illustrations of it that we have developed, are understood by intelligent and discerning minds, but the mass of the people understand nothing about them. Suppose, for example, that the son of a prince has begun to go to school, and he is admonished that if he do not study, his father will not give him the principality. The boy does not understand the

[1] S. 102: 5, 6, 7.

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import of the warning, and continues busy in playing with tops and nuts. But, if he is told instead, if you do not learn to read and write, your master will whip you or pull your ears, from that moment, understanding the force of the admonition, he leaves his sport and play, and is diligent in his studies. Since, therefore, the commonalty cannot understand the torment of being forbidden and shut out from the vision of the beauty of God, the doctors of the law and the preachers, frighten them with serpents and scorpions, and with the fire of hell; for they are not capable of understanding anything else. In the other case, how should the "look out! take care!" from the mouth of the master, with the pain of one or two boxes on the ear, have any relation or resemblance in the mind of the boy with the loss of the principality? . . .

The heavenly pilgrim must forsake his own city, and not fix himself for permanence in the place where he happens to be. And by the word *city*, worldly cares and employments are designated. He must quit them, and find his home in the path of obedience, and forsake the land of tribulation: for the prophet has said, "Love of country is an article of religion."

This road has four stages: the things of sense belong to the first stage; the things of fancy belong to the second stage; the things of speculation to the third, and those of reason to the fourth stage. . . .

The view which man obtains of things in the visible world is through matter, as in the contemplation of a prospect on land. But in the fourth stage, which is that of the reason, man's view is entirely through the medium of pure spirit, as when a man looks into water. But the view he takes, and the intercourse he enjoys in the world of speculation, is as if he was looking at an object from a ship. There is, besides, in the sphere of reason a still higher degree of sight and vision, which is enjoyed by the

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prophets, the saints, and the most devout, which may be compared to a prospect in the clearest weather. Hence, when some one observed to the apostle of God, that Jesus (upon whom be peace!) walked upon the waters, he replied, that "if his faith had been greater, he would have walked in the air."

The view that can be taken by the heart of man, embraces all things that lie in the world of perception and understanding. Its sphere of action and exercise is the whole world. The ascent of man from the rank of beasts to that of angels, is an ascent where he is always exposed to danger and to destruction. He may, with the guidance of the divine guide, mount up to the highest heaven, or may descend through the deceits of Satan to the lowest hell. And the prophet has warned us of this danger in these words: "We have proposed to the heavens, to the earth and to the mountains to accept the deposit of the faith: they trembled to receive it. Man accepted the charge, but he became stupid and a wanderer in darkness."[1]

Know, farther, that inanimate objects are the lowest in rank in the quantity and degree of happiness they obtain, and it is a happiness which knows no change. The place of beasts is in the lowest abyss and there is no path by which they can ascend out of it. The mansion of the angels is in the highest heavens where they ever continue in the same condition, there is neither abasement or ascent from their place. And God also says in his eternal word, "And what have we except for each one a certain and appointed habitation."[2] The position of man is between the rank of angels, and that of animals, because he partakes of the qualities of both. No other rank except man accepted the deposit of the true faith, and indeed no

[1] S. 37: 72.
[2] S. 38: 164.

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other had the qualities and capacities necessary for the acceptance of it. In accepting the deposit man became bound at the same time to accept the dangers and penalties connected with it.

The doctors of the law have not commented upon these topics to the people in general. But this is not to be wondered at, when we consider that the mass of the people regard themselves as fixed in their character and position, and not as pilgrims and travellers to a higher state. There is no possibility of unveiling the things of truth, to those who settle down without desiring to make any progress, and who are contented with the first stages and degrees of the sensible world and of the world of fancy. They can neither attain to a spiritual state, nor understand spiritual laws and precepts. We have ventured, however, to unveil a little of the mysteries, as a type of the knowledge belonging to the future state, so that men might be prepared to understand the questions and affairs relating to that state. But if we had entered into any farther developments, they would not have been able to understand us, for none but those who are endowed with penetration and experience can by any possibility understand the topics to which we have alluded.

There is a class of foolish people, O inquirer after the divine mysteries, who have neither capacity for knowledge, or sound judgment to be able to understand anything of themselves, and who have remained doubting and speculating about the nature of the future state, till they have become bewildered. Finally, as the lusts of the world harmonized with their natures, they have yielded to the whisperings of Satan, and deny that there is any future state. They pretend that the only need there is of speaking of heaven and hell, is for the sake of correcting and guiding the conduct of the people, and they regard as folly the course of those who follow the law and are constant in their devotions.

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If these foolish persons have one jot of sense, it will be easy to convince them with a single word. One hundred and twenty-four thousand prophets more or less, the whole multitude of the saints and all the learned doctors of the law have faithfully followed the Holy Law, have been diligent in their devotions, and with prudent anxiety and dread about the future state, they have endured much pain and suffering. And how does it happen that you, who are so ignorant and stupid, have found out that they were mistaken and in error? What should lead you to prefer your baseless and corrupt fancies to their knowledge and science, and to say that the spirit has no real existence and that it does not continue to live after death? Perhaps you do not even admit that there is any *material* punishment. Truly the health of your moral being is so corrupted and depraved, that there is no cure for you; you belong to that class of whom God says in his holy word: "Even when thou shalt call them into the right path, they will never follow in it."[1]

If one of these men should, however, reply: "Indeed I do not know for a certainty, but why should I on account of an uncertainty, pass my precious life in devotional austerities, and forbid myself the delights and pleasures of the world?" We observe in return. According to your principles, the probabilities are balanced as to whether the events spoken of as belonging to the future world will or will not happen. It follows then as a most rational conclusion, that you ought to act in the same way you would do, if you wished to preserve yourself from a great risk and danger. For, if these events should take place, you may thereby be saved from intense torment and obtain eternal felicity; whereas, if they should not occur, you will have suffered no injury from your precautions. We

[1] S. 18: 56.

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have, besides, the inspired word which declares that all these things will take place; and all the prophets (upon whom be peace!) and all the saints and teachers of religion (upon whom may God have mercy!) have testified to the truth of them.

Do you not see that if you were desirous to partake of food and were just stretching forth your hand to take it, and some one should say, "Beware, and do not eat of that food, for it is deadly poison," or "a serpent has vomited upon it," that although there was a doubt in your mind whether what he said was true or false, still you would believe him and refrain from eating the food? You would say to yourself: "If I do not eat it, I have nothing to suffer but to remain hungry for a while longer, but if I eat it, I may kill myself. It is prudent, therefore, for me to refrain from it."

Again, if you were sick, and a person who writes magical phrases and charms, should say to you, "give me a drachm of silver, and I will write for you a well tried charm by means of which you will immediately get well," although you know that there is no relation of fitness between an external charm, and an internal disorder of the stomach for instance, and that there is little probability of your recovering by its means, you are still disposed to take it. And you say, "Come, let me have it, if it act as a medicine, I shall be a gainer by so many drachms of silver, and if it do me no good, I shall only have lost a single drachm. I ought therefore to try it."

Once more, if an astrologer should say to you, "if you will drink this bitter and disagreeable medicine, you will not be attacked with illness during the whole of this coming year, for the moon is in such a station among the heavenly bodies," notwithstanding the lie of the astrologer should be very clear to your mind, and you have no confidence in what he says, you would reply, "well, let me

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drink it and see; if it do me no good, it will do me no harm." And with the fancied hope of advantage from it, you swallow down the bitter and unpalatable potion as if it were sugar.

Now come and be candid with yourself; you give credit to a false physician, to a false writer of charms and to a false astrologer, for the sake of being delivered from a day or two of illness in this world, and you even undergo suffering for the sake of it. But the learned in religion, for the sake of saving you from the malady of stupidity and rebellion and bringing you to everlasting health and felicity, have exerted themselves to make the verses of the Koran and the holy traditions to serve as a medicine to deliver you from bitter torment. Still you attach no credit to their words. You treat the Koran and the traditions with entire disregard, neither clinging to the commandments of God, nor avoiding forbidden things. You follow the bent of your own inclinations, instead of following the example and law of the prophet of God, and you indulge in many acts of transgression. Nor do you call to mind what will be your condition in the end of it all, nor how long a time you have yet to live in the world, nor what eternity is compared with this world. Do you not know that by choosing a very little pain in the business of religion during this short life and in this worthless world, you may gain eternal felicity, and riches that cannot be taken from you? The pain which we may suffer in this world, however severe, yet does not weigh the amount of an atom in comparison with the pains and torment of the other world. This world is a fading shadow, but the future world is abiding and eternal.

The following is an illustration of the duration of eternity, so far as the human mind can comprehend it. If the space from between the empyreal heaven to the regions below the earth, embracing the whole universe, should be

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filled up with grains of mustard seed, and if a crow should make use of them as food and come but once in a thousand years and take but a single grain away, so that with the lapse of time there should not remain a single grain, still at the end of that time not the amount of a grain of mustard seed would have been diminished from the duration of eternity.

Beware, therefore, beloved of exposing yourself to eternal torments; call to mind the great risk and danger you are to encounter in the future world: address to your soul serious admonitions, before you come to be ashamed and fall into captivity and chastisement: ask your soul, saying, "O rebellious soul, how much misery thou dost undergo for the sake of gaining the world! What long and distant journeys thou dost undertake, how often dost thou remain hungry and thirsty, notwithstanding thou are both transitory thyself and all thou dost gain is transitory; and yet all this time God himself has engaged to supply all your needs. But on the other hand what hast thou done to secure eternal salvation in the mansions of the future world, to be delivered from misery and reach unchanging felicity? If thou art not able to endure the least pain or toil for religion in this world, how wilt thou be able to bear in the future world both material and spiritual torments, together with the torments of the imagination?"

Every man ought to take as the subject of his thoughts, the things which concern the future state,— the pains of its torments, the joys of its felicity, the delight and ecstasy of the vision of the beauty of the Lord, and finally the fact that these states are eternal. Now, is it not strange folly and sottishness to be proud of the transitory pleasures of the world in a life which lasts but for one or two days, and to turn our backs upon future eternal joys? If you are wise you will acknowledge the frailty and errors of your soul, and with an understanding of the purpose for which

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it was created, you will meditate upon your soul, and upon the almighty power and greatness of God as far as the human mind can comprehend them. Recognizing that God's design in creating you was, that you should know him and love him, you should never cease for one moment to walk with humility and prayer in the path of obedience. Regard this world as the place to sow seed for eternity, and after taking such a portion from this world as may give you strength to take the journey to the other world, turn away from whatever is more than this. Realize that the future world is the place for enjoyment and happiness which is eternal, and the land to behold the excellence and beauty of the Lord; and make it your purpose, divine and omniscient grace assisting you, never to cease from the pursuit of them, but to secure as your prey, the phœnix of felicity and happiness.

Chapter V.— On the Love of God.

O traveller on the way and seeker after the love of God! know that the love of God is a sure and perfect method for the believer to attain the object of his desires. It is a highly exalted station of rest, during the journey of the celestial traveller. It is the consummation of the desires and longings of those who seek divine truth. It is the foundation of the vision of the beauty of the Lord.

The love of God is of the most binding obligation upon every one. It is indeed the spirit of the body, and the light of the eye. The prophet of God declares that the faith of the believer is not complete, unless he love God and his prophet more than all the world besides. The prophet was

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once asked, what is faith? He replied, "It is to love God and his prophet more than wife, children and property." And the prophet was continually in the habit of praying, "O my God! I ask for thy love, I ask that I may love whomsoever loves thee, and that I may perform whatsoever thy love makes incumbent upon me."

On the resurrection day all sects will be addressed by the name of the prophet whom each followed, "O people of Moses! O people of Jesus! O people of Mohammed!" even to all the beloved servants of God, and it will be proclaimed to them, "O Friends and beloved of God, come to the blessed union and society of God! Come to Paradise and partake of the grace of your beloved!" When they hear this proclamation, their hearts will leap out of their places, and they will almost lose their reason. Yahya ben Moa'z says, "It is better to have as much love of God, even if only as much as a grain of mustard seed, than seventy years of devotion and obedience without love." Hassan of Basra says, "Whoever knows God, will certainly love him, and whoever knows the world, will shun it."

O thou who seekest the love of God! know that this love is founded upon two things: one is Beauty, and the other is Beneficence. Beauty acts as a cause to produce love, because the being, the attributes and the works of God possess beauty, and every one loves that which is beautiful. There is a tradition which says "Verily, God is beautiful and he loves beauty." And the prophet says, "Desire to transact your affairs with those who have beautiful countenances." It is on this account that the spirit in man has been created in accordance with the image of beauty, so that whenever it either hears or sees anything beautiful, it may have a propensity towards it, and seek for communion with it.

But you should also know, that beauty is of two kinds, one of which is beauty of form, and the other beauty of

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moral character. And know, O beloved, that the reason why man must love beauty of form in his own species, and has an inclination to admire external beauty, is that God created the spirits of men out of a drop of his own light, as he says. "when I have breathed my spirit into him." [1] And as the spirit has thus been created out of the light of the Lord God, it is so essentially beautiful, that if man were capable of seeing the degree of its beauty, he would become bereft of reason and perhaps would perish from the effects of the impression.

This also should be known, that beauty of form belongs to the spirit, and not to the body. It is a proof that there is nothing agreeable in the body by itself, that when the spirit is separated from the body by death, no one has any inclination afterwards to look upon the face of the dead, but on the contrary his feelings repel him and he turns away from it. And however near a friend or relative the person may be, we have no disposition to approach his side again. The body of man is created of opaque earth, and the spirit by entering into the body is entirely veiled, so that it can neither be seen or known.

It is clear then that the beauty of form possessed by man and the beauty of many other things arise from their being created from the light of the Lord. Consider then, as far as human reason can reach, if such beauty and elegance exist in spirits formed out of one drop of the light of the blessed God, what must be the beauty and splendor of the Lord God himself. Since then the beauty of every beloved object is derived from his light, and that the beauty of every thing that is beautiful is from him, it follows that he who is wise, ought not to permit himself to be deceived by the soul which passes away, and to be attracted to that beauty which is fleeting, but that he should

[1] S. 15 : 29.

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turn to the contemplation of that painter who is full of all perfection, and of that maker with whom is no change, and earnestly seek after the vision of his beauty with his whole heart. Let him continue day and night with burning and consuming desire in humble prayer, longing after his beauty and after union with him.

I have made a home for thy love in my heart,
While affection for something else hovers around the home.
But it is folly to contract friendship, with aught else than thy beauty,
For there is none to be loved but the eternal Friend.
He who has made thee to be his happiness and refuge,
Has already joined himself to the perfect excellence.

O! seeker of divine love, that which renders man favorably inclined to persons of virtuous character, is the fact that God has created man after his own character; as it has come to us in the tradition that, "verily God created man after his own image." Hence whenever man sees or hears of a quality belonging to his own race and kind, as justice, generosity, forgiveness or patience, he will certainly have a sympathy with that quality and exercise love to its possessor. If we hear for instance that in a certain country there is a just sovereign or a just vizier, we heartily love that king or vizier, and we are always praising his excellence and worth, although there is not the least probability of any advantage accruing to us from his justice. Such a sovereign was Nushirvan, who notwithstanding he was an infidel yet as he was just, the heart of every man is drawn towards him. If again we hear of the knowledge, science, clemency or munificence of any persons, as of the Imam Abu Hanifé, of the Imam Shaféi, of Bayézid of Bistan, or of Junëid of Bagdad, the spirit of a man will be attracted towards them on account of those qualities, he will love them, and he will certainly desire to see them and to be with them. If we hear of a generous man, although he

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may be in a foreign country, and we have no hope of any advantage from him or of any token of his generosity to ourselves, yet still from necessity we will love him, and whenever his name is mentioned we will invoke blessings upon him and praise him. It is thus with Hatem Tai whose name, though he was an infidel, is upon every tongue, because he was a generous and benevolent man, and all hearts are irresistibly led to love him. . . .

We see then that the love we bear to persons endowed with the virtuous qualities of man, is not bestowed by us for the sake of any fancied advantage from them or any hope of gain, but that on the contrary it is because the spirits of men are created in correspondence with the character of God, and when we see a trace or mark of a quality or affection of a kind like our own, we cannot help being attracted towards it, and must necessarily love it.

In this view of the subject, O seeker of the truth, and friend who longs for the bright vision, when you consider what an impulse we have to admire and to love man who is encompassed with so many defects, and whose qualities are subject to decay, — be candid and reflect, that all the attributes of God are perfect, that all his titles are glorious, and that all his works are made in infinite wisdom, and how then can there be a man of such animal affections and propensities as not to love him with all his heart and soul! And how can a person having the appearance of a man, be such a stone, as not to be willing to make a sacrifice of his head and even of his soul, impelled by his absorbing affection for Him?

Separation from thee, would quickly destroy me,
Separation from one's friends is fatal.
If thou shouldst separate from me still would I
Be occupied with thee, ever active Friend,
Who art the object of my desires and my researches;
For thou wilt not turn away from him who loves thee.

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You should know also that in the world of spirits, God had ennobled man with beauty and its qualities, and had made him sufficiently acquainted with Himself and His attributes; and the spirits continued for a long time participating in enjoyment in the land of affection, intoxicated and in ecstacy with the cup of love and the wine of celestial union. Afterwards in accordance with divine wisdom and by soverign decree, they fell from that exalted world to this lower world,—from the world of union to the world of separation. In this world of trial, having entered into bodies and become entangled with the things of sense and with worldly occupations, and shut out from the spiritual world, they forgot its intimate friendships and the joys of its society. Being so far distant from that world, the being and character of God became completely veiled from the view of some, and the love and union which had existed in their hearts from all eternity disappeared. None the less however, it is still the case, that when man sees beauty and perfection, the spirit cannot help admiring it. But as the intimacy and friendship which had formerly existed have been clouded over, and the animal impulses, passions and lusts have become predominant, they imagine that the love of pleasure belongs to the delights of religion, and regard it as a necessity of the soul.

The spirits of some men, however, in becoming attached to a body, retained the divine guidance, and the spiritual world in consequence was not concealed from their view, nor did they forget its friendly society or the attributes and qualities of its holy spirits. And as the glory of the infinite being and his attributes was not veiled from their eyes, their desire for the blessed union and longing for the vision of beauty increased daily. In accordance with this, it is related by Soheil Testeri (may God's mercy be upon him!) that "from the moment that the blessed God in the world of spirits and the assembly of holy union

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asked the spirits "Am I not your Lord?"[1] and they called out in an answer "yes!" that loving answer has never waned or decayed within my soul. When I was only three years old, I used to spend all night in the worship of the Lord God, without giving any slumber to my eyes."

O thou who longest after the love of God! the second cause of love in man which we have mentioned, viz: beneficence, operates through the state of poverty and need in which man has been created. Both in the affairs of the world and in the concerns of religion, man is in want of an infinite variety of things, as God says in his word, "Verily, God is rich, but ye are poor."[2] Hence a man always loves and honors whatever person enables him to obtain any object of which he stands in need, or who makes it probable that he will obtain it. This will be the case especially, if the same individual has at various times supplied his necessities. He will then be enslaved to him, heart and soul, and whenever his name is mentioned will chant his praise and invoke blessings upon him. The proverb says, "man is a slave to beneficence."

In matters of religion, man has need of helpers of two kinds. The first class are the great expounders of doctrine,[3] who instruct him in religious precepts, and preserve him from the darkness of ignorance and the dangers of doubt. They also make him acquainted with the restrictions of the law, and the regulations and ceremonies of worship. They explain to him what conduct corresponds with rectitude, and what is improper,— what is lawful and what unlawful. The second class of helpers to man are the venerable preachers.[4] It is their province to throw

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[1] S. 7: 171. [2] S. 417: 40.

[3] "Ulema"—the learned in the Divine Law. See Note D.

[4] Sheikhs, *i. e.* elders, who are the preaching class.

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light upon the nature of the way of life, and upon the true condition in which man is placed. They point out the means and methods by which the slave of desire may secure a change of his vicious inclinations, and by which the disordered soul may obtain a pure and virtuous character. They set forth the transitory nature of the world and the shame and sin of being attached to it. They endeavor to persuade men that the design of their entrance into the world is that they may love and know God; and they strive to turn them away from following the world, by giving them ideas of the joys and rest of the other world, and of the delight and preciousness of the vision of the beauty of the Lord, that so they may live as pilgrims to eternity. The whole reason why the apprentice loves his master, and every disciple loves his teacher, and why the wise and excellent love the experienced Sheikh whose lessons they hear, or love the doctors of the law and the saints of olden time is that they have been *beneficent*, and have supplied their wants.

In matters pertaining to the world, beloved, the necessities of man are of such kinds that there is no occasion for our entering into any details. Do you not realize for instance, through how many hands the food you put into your mouth passes, before it is brought to you, and how many persons have been employed in the service of preparing it for you? And man has, in short, the same kind of need of helpers in his clothing, home, and in all the arts and trades, as has before been mentioned. He needs, also, the winds and rain, the sun and moon, the earth and sky, as we find in the verses of Sheikh Saadi:

> The clouds, wind, moon, sun and stars are working ever:
> Therefore if a loaf of bread comes into your hands, eat it not without gratitude.

And after we have eaten our food, how many agents we need to digest it, and to convert it into fat, milk and blood.

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We have before remarked upon the number of servants there are within your body, of which you have no knowledge.

And now, student of the celestial way, and seeker after the love of God, come and consider a little with the eye of reverence and the mind of thoughtfulness. If a person should give you a drachm of silver, or a suit of clothes, or serve you for a single day and conclude some business which concerned you, you would love him as long as you lived, and you would always speak well of him wherever his name was mentioned, although the service he had performed for you, and his act of beneficence was only effected through the will of God and by his power. Be sincere now and say, why should you not love and sacrifice every thing for the sake of God, who created the heavens and the earth, who has taken care of all your affairs long before you desired it of him, who has provided for all your necessities before you had any notion of them, who gives you so many thousand mercies at every breath, who has not ceased to sustain you, even when you were disobedient to his commandments and rebellious, and who has covered your shame, for the sake of the Friend of God? Ought you not to praise him with your tongue, and love him with your heart? Is it right, overwhelmed as you are with his unfailing mercies and infinite bounties, that you should regard these mercies as coming from other source than God, and that you should thank some other one than Him for these services and favors, and that you should love some other one instead of him?

It is in vain that the eyes watch for any other love than thee.
It is a loss for the eyes to weep for any other friend.
Thou art the true friend! If thou deign to look upon me,
It will be well with me, as if my eyes had never wept.

What shall I do with that life which is not passed in remembrance of thee?
What shall I do with the eye that is not sad with longing after thee?

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What shall I do with the heart that is not the home of thy love?
What shall I do with the soul that does not make itself a sacrifice in thy Way?

O inquirer after the love of God! The love of God exists in every heart, though it lies concealed, just as fire exists in the flint stone, until it is drawn out. If you take the steel of desire and affection into your hands, and with it strike the heart, you obtain fire by the means, and your soul will be filled with light. The malice, deceitfulness, hatred, vileness, envy and strife that are in the heart will be burned up, and it will be freed and purified from sensual perturbations. But if you are careless and do nothing and pass several days without seeking, the heart will again become like fire covered over with ashes, which by remaining a long time unused, will finally be extinguished. So at last the heart, becomes encased with sensual impurities and with the blackness of the passions, and is no longer capable of being enlightened with the light of truth. Our refuge is in God!

O, faithful friend, who art worthy to be loved! know, that the love of God is a standard that leads to victory. Whoever seeks refuge under it, will be a sovereign in two worlds, and lord of a throne at the king's court. This love is a universal solvent to secure happiness. Whoever secures it, is richer than in the possession of both worlds. God is always rich, notwithstanding all the world is provided for through him. The heart which bears no traces of the love of God, is like a dead corpse, which knows nothing of its own spirit. Still there is no person among reasonable beings who will say that he does not love God, or who will not make pretensions to possessing a love for him. But it is like an empty claim, upon which no decision can be based and, unless the witness is a faithful one, no conclusion can be formed. If you should be asked, do you love God, beware and give no answer. For if you say

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I do not love him, (our refuge is in God), you would make yourself an infidel. And if you say in answer, "I love him," yet you have no signs or tokens of your loving Him.

Now know that there are *seven signs of love to God.* In whomsoever these marks are found, his pretensions to loving God are to be regarded as well founded.

The first sign of love to God is, not to be afraid of death, and to be always waiting for it. For death unites the friend to his friend,—the seeker to the object which he seeks. As long as attachment to and dependence upon the world cannot be broken off, the traces of love to God cannot be visible. If a person, however, is afraid of death and does not feel a readiness to go into the presence of God, and yet is making every provision for his journey into the other world, it does not follow that he does not possess the love of God. It is, on the contrary, an evidence that he does love God.

It is a second sign of love to God, when a man prefers the love of God to any worldly object, chooses whatsoever draws him near to God, and forsakes whatsoever has a tendency to turn him away from God. He desires always to act in accordance with his will and with his approbation. But it is not an indication that a person is entirely destitute of love to God, because he is not in every circumstance submissive to the holy will of God. For, in some persons love may exist in perfection, while in others it may be in some measure defective. It is said, for example, that during the life of the apostle of God, one of his companions was a wine drinker, and he had oftentimes been punished for it. Another of his companions one day vexed at his conduct, cursed him. The prophet happened to hear him curse him, and knocked for him to come in. When he had come into his presence he said, "Why do you curse that man? He is both a friend of God and of his prophet, and loves them."

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The third sign of a man's love to God is that the remembrance of God is always fresh in his heart. He never ceases to meditate upon God. Every man thinks upon and calls to mind an object in proportion to his love to it. If a person's love and affection is perfect he never forgets that object. If a person say, I love both God and a certain worldly object, attention should be paid to see which of them he loves the most. And then that object can be said to rule in his heart which he loves the most. Gradually from day to day, the object which preponderates will efface little by little all affection for the other.

The fourth sign of love to God is, to love and respect the powerful Koran, regarding it as the word of God. A man ought to praise and love the prophets and saints, as the friends of God. He should love all men, saying that they were all created by the will and power of God. Whatever person attains to this point, his feelings of envy and hatred and even his coldness of looks will be quelled and disappear, and he will treat all individuals as his friends.

The fifth sign of love to God is that a man will choose the closet and retirement and have an eagerness for secret prayer. He will long and wait for the night, that the avocations and hindrances of the world may be banished, that he may be embarrassed by no distractions in his supplications to his incomparable and unique Friend, and that he may be alone in familiar intercourse with God.

It is reported that in the days of the children of Israel, there was a slave who prayed every night from evening until morning, but he went out and performed his morning prayer under a tree. God spoke by inspiration to the one who was the prophet at that time and said, "Go and speak to that slave my servant thus:— You abandon prayer to me in secret and come out here to pray under this tree, for the sake of the pleasure you derive from the

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music of the birds over your head. But in so doing you mutilate as it were my love and you will not again obtain it perfectly." It is also reported that God once said to David, "O! David, that man is a liar, who pretends to love me and yet goes to bed and sleeps the whole time till morning. For does not a friend desire to see the countenance of his friend, and is he not eager to have intercourse with him? Whoever wishes to see me, will seek me and will find me."

The sixth sign of love to God, is when a man finds the worship of God to be easy, inviting and delightful. It is related that a certain preacher[1] used to say, "I have served God in worship sixty years with irksomeness and constraint. I afterwards served him yet sixty years more, and my devotions were to me spiritual food; and in the absence or disuse of them, I did not enjoy a moment's peace or quiet of mind."

The seventh sign of love to God is, that a man loves the sincere friends and obedient servants of God, and regards them all as his friends. He regards all the enemies of God as his enemies and abhors them. And God thus speaks in his eternal word. "His companions are terrible towards the infidels, and tender towards each other."[2] A Sheikh was once asked "who are the friends of the exalted and blessed God?" He replied: "The friends of God are those who are more compassionate to the friends of God themselves, than a father or a mother to their children."

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[1] Sheikh.

[2] S. 48: 29.

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Note A, p. 54.

Preserved Table. This record-tablet of Mohammed, may have been suggested to his mind by the two tables of stone of the Ten Commandments of Moses. A clear view of what this table is, may be obtained from the following extract from a treatise of Berkevi explaining the Mussulman dogmas, which is at the present day a text-book in the Turkish schools.

"It must be confessed, that good and evil and every thing in short happens from the predestination and foreknowledge of God,—that all which has been and will be, was decreed from eternity and is written upon the preserved table,—that nothing can happen contrary to it,—that the faith of the believer, the piety of the pious man and his good works are foreseen, willed, predestined and decreed in writing on the preserved table, are produced, accepted and loved by God;—but that the infidelity of infidels, the irreligion of the wicked and their bad actions happen indeed with the foreknowledge of God, by his will, and as an effect of his predestination inscribed upon the preserved table, and by the operation of God,—but not with his satisfaction or affection."

Note B, p. 56.

Mystics. Wherever this word is found in this treatise, it is to be understood that the original word is *soofee*, and sometimes the word has been allowed to stand untranslated. Soofee does not necessarily mean any one particular society of Mussulmans, but includes all persons as well as orders and congregations, who embrace mystical or transcendental modes of interpreting the Koran and who conform their life in a greater or less degree to their mystical notions. Soofee, Dervish and Fakir, are different words for various classes of oriental monks and mystics. They are found wherever there are Mussulmans, and the differences between them and other Mussulmans bear a considerable relation to the differences developed by mystics, pietists or puritans in Christian churches. They differ also much among themselves in their modes of spiritualization and in their ceremonies and practices. There is also much jealousy of each other, between the dominant orthodox clergy and doctors of religion, and the mystics, dervishes and preachers. The orthodox clergy

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admit only the grammatical and literal — the external meaning of the Koran ; but many Soofees pretend that the outward meaning is but the shell, and that they seek for and expound the inward or mystical meaning. The reverence and esteem for the Soofees and Monks is so great with the people, that the clergy and doctors usually conceal their opposition and jealousy.

"Soofeeism has existed in one shape or other in every age and region ; its mystical doctrines are to be found in the schools of ancient Greece and in those of the modern philosophers of Europe. It is the dream of the most ignorant and the most learned : it is to be found in the palace and the cottage, in the luxurious city, and the pathless desert."

The fundamental doctrine, and the great object of longing of the oriental mystic is union with God. The whirling Dervishes as they are popularly called, imitate the founder of their particular order and whirl around on their toes for an hour to the sound of soft music and muttered chants : and they imagine that the dizziness which is created and the prostration which follows is an inspired ecstacy and an approximation to the desired union. Mussulman mystics are extensively accused as are also a class of perfectionists in the Christian church, of regarding external actions as morally indifferent to those who are spiritually enlightened. Their doctrines have been abused among themselves by fanatics to lead them to the commission of crime, as in the case of the attempt to assassinate the shah of Persia by the Babis. We should no more be led to think that there was any tendency to abuse for evil purposes from reading this treatise of Ghazzali, than to infer the same from devotional and mystic writings of the western world. Ghazzali, is as much disposed to censure hypocritical pretence among Soofees, as some writers on Persia have been to class nearly the whole body as hypocrites.

Note C, p. 82.

The Mohammedan calendar being regulated by the lunar months, every twelfth lunar month is devoted to fasting, and it is of the greatest importance that the very first appearance of the moon should be watched, to know just when to commence the fast. Certain months and days of the month are peculiarly appropriate to works of charity. The days on which the caravans of pilgrims ought to arrive at Mecca, and the days for going around the black stone of the Caaba, occur also on certain fixed days of lunar months. The advantages and moral ends of having a moon, must be looked at

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from the point of view of the theological theory of the author, which is nothing less than that the moon was created on purpose to render possible, and to aid in carrying into effect, the ordinances of the uncreated Koran.

Note D, p. 14.

Interpretation of the Koran. The extract below from the work of Ghazzali, the *Tehafeti Felaséfé* or *Destruction of Philosophy*, while it shows the position he assigns to the doctors of the law, exemplifies also the character of his genius, and the measure of independent thought tolerated among Mussulmans. He fearlessly adopted whatever discoveries in science could be established by proofs, and defended them even when apparently opposed to the language of the Koran : the dogmatical interpretation of the Koran must yield to stubborn, undeniable facts in science. I translate it from Hajji Khalfa's *Jihani Numa*, or View of the World, where it was introduced by him to enforce the claims of scientific evidence to be received by the faithful.

"Know that the differences of opinion between philosophers and mankind generally are of three kinds. The first kind of difference is simply a verbal one. As for instance they speak of the maker of the world as essence or substance (*jouhar*), while at the same time, they explain the word to mean that which exists by itself and independent of place.

"The second kind of difference refers to questions, where there is no difference between their system and the principles of our religion, and where there is no occasion of appealing to the prophets in confirmation of the matter in dispute. For instance the philosophers say, that an eclipse of the moon is an indication that its light is obstructed on account of the earth's coming between it and the sun, seeing that the moon derives its light from the sun, and that the earth is a sphere surrounded by the sky on all sides, and therefore when the moon falls into the shadow of the earth, its light is cut off. The Philosophers also say that an eclipse of the sun arises from the moon's standing between the observer and the sun, and from a conjunction of the two at the same moment.

"The same may be said in regard to this language as was observed in reference to the disputes about words — that one need not be anxious about refuting it. Whoever imagines that it is a religious duty to dispute upon this subject, has in fact attacked religion, and injured his own cause. For in truth these positions are fortified by

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mathematical proofs, about which there can be no doubt. Whoever investigates an eclipse, can establish it by demonstration, and can point out its peculiarities, the period of its commencement, the extent of it, and the period of duration until the reïllumination begins. And if some one tell him that the demonstration is contrary to doctrine, let him not doubt the demonstration, but rather let him doubt the interpretation given to the law (of the Koran). The wrong done to the law by those who defend it with false interpretations, is greater than the wrong which is done to it by those who find fault with it on a correct interpretation — as says the proverb, 'a wise enemy is better than a foolish friend.'

"If some person should argue, that as according to a tradition, the Prophet once said, 'When God manifests his glory upon anything, it humbles itself before it,' and that therefore this is to be taken as an indication that an eclipse arises from an act of humility in the presence of God, we reply, that this report is not a genuine tradition, and that even on the supposition of its genuineness, it would be better to throw light upon its meaning, than to make use of it for altercation in categorical premises. For when the proofs are definite, we ought not to be controlled to such an extent by unexplained texts of the Koran. It is a cause of great joy to the infidel when the apologist for the faith pretends that such views are contrary to the faith, for it then makes it easy for him to refute the law. The world is now disputing whether it is a genuine tradition or merely ancient. But if its genuineness should be established, it would still be a matter of indifference, whether the earth were round or flat, or whether the heavens above and what is below are more or less than thirteen layers — seeing the thing sought to be proved is, that at any rate they are all the work of God.

"We come next to the third difference of opinion, in which the matters disputed about are at the foundation of religion, as the creation of the world, the attributes of the creator, and the resurrection of the body. In this case it is without doubt our duty to refute the error with convincing arguments."

The work of Degerando, *Histoire comparé des systèmes de philosophie*, tome iv, Paris, 1823, may properly be referred to, for comparison with Smölders's *Essai*, to aid farther in appreciating the principles of Ghazzali in interpreting the Koran, and the grounds of his opposition to Aristotle. His picture of the stand-point of Ghazzali seems accurate and just. See also, Whewell, *History of the Inductive Sciences*, 3d edition, 1857.

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Report of the Second Class in the Second Department—Botany. By CHARLES H. PECK, Chairman of the Class.

[Read before the Albany Institute, March, 18, 1873.]

Mr. President and Gentlemen of the Albany Institute:

It is scarcely to be expected that an annual report which should simply record the indication of progress in any one science for a single year would be a long one. The mere results of many years of investigation may sometimes be expressed in a few sentences. Progress in the development of any natural science is necessarily slow. Nature's works are so vast, so numerous, so various and so complicated in their relations, while her investigators, her patient observers and persevering inquirers are so few that great and rapid advances are not possible. Besides, the method of investigation is almost always such as to require slow and cautious steps. We are compelled first to seek out and carefully ascertain a vast number of facts and then from these we are to deduce the great underlying truths and principles upon which the phænomena rest. If we attempt to theorize we are as liable to build upon the sand as upon a rock. Our theories are reliable only so far as they are sustained by facts. In the vegetable kingdom, especially, there are so many exceptions to general rules, so much that is peculiar to each group and even to each species that we need to study the most minute details.

The earlier botanists devoted themselves chiefly to the study of the higher orders of plants, i. e., the phænogamia or flowering plants, to the work of describing and classifying, grouping and arranging them into a system which should indicate their relations to each other and facilitate the acquisition of knowledge concerning any particular species

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or group. But in these later days the facilities for the study of cryptogamic plants have been so increased by improvements in microscopes that the realm of botanical investigation has been widely extended, and now no small part of the attention of botanists is devoted to the exploration of those hidden fields which the microscope reveals and makes accessible. Here we are ushered, as it were, into a new world of beauty and of wonder, here is opened a door within whose portals we may find abundant food for thought and marvelous evidences of wisdom and design that challenge our highest admiration. Accustomed as we are to consider these diminutive plants as very low in the scale of being, it is with no little gratification that we find them endued with characters so varied and yet so constant as to afford abundant means for systematic classification and specific identification. Though they may be of less direct value than other plants in an economic point of view, still they are not without value and some on the other hand are not to be deemed wholly uninjurious. The attacks of the injurious ones are more to be feared because they are the attacks of a hidden enemy. So minute are the germs, so secret their dissemination, so untraceable their movements and so immense their numbers that it is difficult to contend with them. Similar relations exist in the animal kingdom. Thus we suffer greater pecuniary loss from the ravages of such minute creatures as the wheat midge and the Hessian fly than from the inroads of larger but less numerous depredators. Numbers avail more than strength. Canada thistles and white daisies are less to be dreaded by the farmer than the rusts and smuts of the grain fields. Such considerations ought to have some influence in directing attention to the development of the science of cryptogamic botany. As an indication of an increasing interest in this direction we may briefly refer to the following publications of the past year.

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1st. The translation, for the Transactions of the New York State Agricultural Society, of Dr. Fisher's *Contribution to the Biology and History of the Development of the Ustilagineæ*, makes this work available to those who are conversant with the English language only. The species of Ustilago, are somewhat numerous and two of them, *U. Carbo* and *U. Maydis*, are especially injurious to our crops of grain and Indian corn. It is this power they have to affect us in our material interests that causes the most practical as well as the scientific mind, to hail with satisfaction every new acquisition of knowledge concerning these parasites, every new discovery that tends to bring them under our control. From Dr. Fisher's contribution we learn that he was able in some cases to trace the mycelium of the parasite in and through the tissues of the supporting plant from its earliest growth up to the time and place of the spore formation. It was found, even in parts of the supporting plant, beneath the surface of the ground, although the spores of the parasite are never produced in such parts. Hence the conclusion is that the parasite enters its host plant at a very early period of its existence. But how it enters, just when and under what conditions, is a problem yet to be solved, and upon the solution of it would seem to depend the intelligent application of a remedy. If the germ of the parasite is in or upon the seed of the supporting plant, ready to attack the sprouting embryo and grow with its growth, we must take care to plant only unaffected seed. If it requires peculiar conditions for its development it is desirable that we understand those conditions in order to avoid or counteract them.

2d. Genera Lichenum, an arrangement of the North American Lichens, by Prof. E. Tuckerman, is a valuable repository of information in the department of botany of which it treats. It not only discusses the arrangement of the genera but also to some extent the grouping of species.

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Tribe, family and generic descriptions are given, several new species described and the value of spore characters has received due consideration. This work, with the synopsis of the species of North American lichens which is expected to follow it as soon as the health of the author will permit, will doubtless give a new impulse to the labors of lichenists in this country.

3d. We must not pass, without notice, *Grevillea* a monthly journal devoted exclusively to cryptogamic botany. Although published in a foreign land it bids fair to contain much that will be interesting to American students. Already the Rev. M. J. Berkeley has commenced a series of articles in it entitled *Notices of North American Fungi.* In these articles many new species are described, species that in some instances were detected years ago by the late Dr. Curtis and his fellow workers, but that have until now been known by mere cabinet or manuscript names. These we now believe are to be fixed by good definite descriptions. It certainly augurs well for cryptogamic botany when an illustrated periodical of the character of *Grevillea* is regularly issued and generously sustained. If we turn our attention to phænogamic botany we have no new issue of American works to record.

The *Bulletin* of the Torrey Botanical club has just completed its third year. It is our only periodical devoted exclusively to botanical subjects. It has met with such favor and is so manifestly needed as a medium of communication between botanists that its managers are not only disposed to continue it, but if possible to enlarge its pages and its sphere of usefulness.

Interesting and able botanical articles have from time to time appeared in our various scientific and agricultural journals and reports. To specify them all would be tedious. As a whole they tend to show that more thought and attention is now bestowed upon this science than a few years

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ago, its friends dared to anticipate. Among the important ones we merely mention the botanical contributions of of Prof. Asa Gray, in the Proccedings of the Academy of Arts and Sciences, and the address of the same before the American Association for the Advancement of Science; the former containing descriptions of several new species from the western part of the country, and some valuable notes on synomymy; the latter, some exceedingly interesting thoughts on the redwoods of California and on plant distribution.

Let us pass now from the consideration of publications to that of collections. We express no new thought when we say that an herbarium of specimens properly selected, well prepared, systematically arranged and authentically labeled is in some respects more valuable than an extensive botanical library. For the study of structural characters, for the ready identification of unknown or unrecognized species, as a repository of typical specimens, its place can not easily be supplied by books. Even in the field the facilities for comparison, for grouping and systematizing are scarcely equal to those afforded by an herbarium in which plants of different climes and remote localities are brought together before the eyes. The student's opportunity and the plant's occurrence are not always coincident, but the contents of an herbarium may always be accessible. Especially are such collections desirable in the more advanced institutions of learning where they may be of much aid in the illustration of lectures and in the enforcing of instruction. Our colleges are not indifferent in this matter. From time to time we hear of the purchase by or of the donation to, one or another of these institutions of some large and valuable collection of plants. We have been informed that recently a magnificent herbarium of sixty-three thousand species has been purchased for the Torrey Botanical club, but it is expected that it will be

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made available also for the use of Columbia College. This together with the extensive herbarium of Dr. Torrey will place Columbia College in a most enviable position in respect to facilities for botanical instruction.

The opening of the western territories has made accessible a vast and most interesting field of operations, which botanists as well as other scientists have not been slow to occupy. The exploring expeditions carried on under the auspices of the general government have usually been accompanied by a botanist or by some one whose duty it was to collect and preserve specimens of the plants discovered. The magnificent volume noticed in a former report had its origin in one of these expeditions. The botanist connected with Dr. Hayden's geological expedition in the Yellowstone region the past season, unlike some of his predecessors, did not make collections of flowering plants alone, but also included in his acquisitions numerous specimens of cryptogamic plants. Private enterprise also extends its researches into these distant localities as is attested by the collections of Mr. Elihu Hall in 1871 and of Dr. C. C. Parry in 1872.

The additions to our own State herbarium the past year, are two hundred and sixteen species by collection, forty-eight by contribution, two hundred and sixty-four in all. This herbarium in the last five or six years has grown from a representation of about fourteen hundred species, of which about fifty were cryptogamic, to one of about three thousand five hundred species, nearly two thousand of which are cryptogamic plants. Of these there are in round numbers seventy-five ferns and fern allies, three hundred mosses, sixty liverworts, one hundred and sixty lichens, one hundred algæ and thirteen hundred fungi. It is with no little gratification that we refer to this collection, not because of its magnitude, for it claims to illustrate the botany of this one state alone, but because of its com-

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pleteness. All classes of plants, save the wholly microscopic desmids and diatoms, are represented in it. The best specimens in all cases of choice have been selected, and the purpose has been, not to show merely a stem or branch bearing leaves and flowers, as is too often the case in herbaria, but to exhibit the whole plant, including root, fruit and seeds, also all the marked varieties of variable species. In the case of the fleshy fungi, which generally shrink and change color notwithstanding the best efforts at drying them, colored sketches of the fresh plant are placed on the species sheet with the dried specimen. To the specimens of minute species magnified sketches of the plant and its characteristic organs are often added. Besides this the collection contains the type specimens of more than three hundred new species of fungi, a fact which gives to the herbarium an unusual value and which in future years will cause it to be eagerly consulted and confidently resorted to as an arbitrator in cases of doubt, perplexity and dispute.

In pursuing the investigations that have been undertaken by one of your committee, most interesting discoveries are sometimes made. We will venture to speak briefly of one or two of these made the past year, partly because every new discovery adds something to the sum of our knowledge and partly because such discoveries tend to encourage further inquiries into the mysteries of nature.

In a certain part of the great wilderness known as the North woods, a small whitish mushroom-like fungus was found. It had every appearance of being an Agaricus belonging to the subgenus Clitocybe. The only remarkable feature about it was caused by the presence of a few long, straight, stiff hairs scattered over its surface, an unusual character in a Clitocybe. As it was desirable to have spores of the plant to place in the herbarium with the

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dried specimens, a pileus was placed upon a piece of black paper in the usual manner. The result was unexpected. The deposited spores were colored, not white as in all species of Clitocybe and as there was reason to suppose they would be in this case. An examination of the collected specimens revealed the fact that the lamellæ, i. e., the radiating plates on which the spores are produced, had changed in color from white to a kind of rusty-brown approaching snuff color. It was evident that the plant could no longer be considered a Clitocybe nor any other member of the genus Agaricus. Further investigation served to locate it exactly midway between the two genera Lepista of Smith and Paxillus of Fries. In the former the lamellæ are distinct and the spores are white, in the latter the lamellæ anastomose near the base and the spores are colored. In our plant the lamellæ are distinct but the spores are colored. Thus it admirably connects the two genera and serves to support and confirm the opinion of the venerable Fries, the father of mycology, who had placed Lepista as a subgenus under Paxillus. The union, so neatly accomplished by this intervening species, is the more interesting because the genus Paxillus is connected by Lepista with the genus Agaricus and on the other hand by intervening forms with the genus Boletus. Thus we have a complete series of transitional forms uniting the extreme genera Agaricus and Boletus. Thus it is that new discoveries serve to fill up gaps in the system and bring us nearer to truth and to a realization of that harmony and unity of design that pervades all of Nature's works.

It is not uncommon in spring and early summer to find upon the branches of the shrub usually called pinxter flower, *Azalea nudiflora*, fleshy, succulent excrescences or gall-like bodies of a somewhat globular, though frequently irregular form. They are of a pale green color, smooth, of a uniform texture throughout and generally one or two

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inches in diameter. They are not unpleasant to the taste and are sometimes eaten by voracious school boys to whom they are known as *May apples*, and by whom they are often supposed to be the real fruit of the shrub. So commonly is this production observed that older and more thoughtful minds have wondered and sometimes even asked why it is that no mention is made of it in any of our botanies. The idea seems to have been entertained by some that like most other gall-like excrescences, they are of insect-origin, but we have never been able to find anything published concerning them. Having therefore somewhat carefully examined them with a view to ascertain their cause for ourselves, we have come to the conclusion that they are fungus-galls, and as such they have been described and the fungus named in the last botanical report made to the Board of Regents of the University.

A careful dissection of many galls failed to reveal any signs of insects or larvæ in them, neither in old and withered galls do any apertures or places of exit appear, as they certainly should if any insect had escaped therefrom. Occasionally an insect larva may be found concealed in the external cavities of the gall, and sometimes they eat into its pulpy substance from the outside, but these could have nothing to do in producing it. On the other hand there are evidences of a fungoid origin. The galls soon become covered with a white bloom or minute mealiness, which is found by microscopical examination, to be the spores of a fungus. A further investigation shows that from the whole surface of the gall elongated cells protrude upon the apices of which these spores are borne. The mycelium of the fungus was not satisfactorily traced in the substance of the gall, but there can scarcely be a doubt that by skillful manipulation it may be detected, especially in the younger galls. Similar galls occur upon *Andromeda ligustrina* and on some species of Vaccinium. It is worthy of mention

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that these are all Ericaceous plants. In like manner the species of Podisoma attack only the junipers on which they produce the fungus galls known as Cedar apples, and the black knot fungus produces its excrescences on plum and cherry trees only. Each gall-producing fungus has its own habitat beyond which it cannot go.

The subject of plant fertilization continues to receive a share of the attention of botanists. Without entering into details let it suffice to say that the tendency of discoveries in this direction is to show that self fertilization is much more rare and fertilization by the agency of insects is more common than has generally been supposed. Various singular and beautiful contrivances have been detected which were evidently designed to secure cross fertilization. Hence it is that some plants, when removed beyond the reach of those insects that aid in their fertilization, seldom or never bear fruit unless fertilized by artificial means. What a view of mutual dependence does such a fact present. The plant is necessary to the insect for sustenance, the insect is necessary to the plant for propagation. The continuance of each depends upon the other. Who can consider such intimacy and the beauty of such relations and yet fail to wonder and admire! But it is not to be supposed that this mutual dependence extends to all plants. By a wise provision many of those plants that have become the great sources of food-supply for man and beast are exempt from the hazards of insect fertilization. The pollen of our corn fields, grain fields and meadows is sown broad cast by the winds. A kind of wholesale fertilization is necessary here where insects, unless they should swarm in countless myriads, would be inadequate to the task.

In a former report it was intimated that there were difficulties to be encountered in the study of fungi. The truth of this might be inferred from the fact that although we were not entirely without descriptive lists of our ferns,

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mosses, lichens and algæ no successful attempt had been made to give us a manual of fungi. It may not be out of place to allude briefly to some of these difficulties. Not that we would discourage any or divert them from the pursuit of this most interesting branch of botany, we desire rather to encourage and commend, but because difficulties are more easily overcome when we know exactly where they are, and what they are, and because in this way the direction in which efforts should be made to elucidate and simplify the subject may be indicated.

The vast number of the species with which the student should form an acquaintance has tended to retard the development of the science of mycology. The species of fungi outnumber all the other cryptogams combined. The British species now known exceed twenty-eight hundred. The North Carolina species, according to Dr. Curtis, are more than twenty-three hundred, but all the other cryptogams of that state are not quite six hundred. In our own state the fungi now known are about thirteen hundred species, but little less than twice the number of the remaining cryptogams, and almost as many as the species of flowering plants. In the introduction to *Centuries of North American Fungi*, published by Rev. M. J. Berkeley and Rev. M. A. Curtis, in the Annals and Magazine of Natural History, they say: "It was intended, at first, to publish the whole in an especial work dedicated to North American Mycology, but it was found impossible to prepare so voluminous a book as a complete account of the Fungi of the United States, within any fixed time, and we have, therefore, thought it right to publish the multitudes of new species which exist in our Herbaria, by way of Prodromus."

The immense number of species in some genera is a source of difficulty. It is well known to botanists, that those genera which abound in species are the most diffi-

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cult to master. Aside from the mere matter of numbers, the species in such genera seem more subject to variation than in others, and appear to run close to, if not into each other. Thus it is in flowering plants with the genus Carex, which of itself is a study of considerable difficulty, and one capable of absorbing the whole attention. And yet, in our state, there are not half as many species of Carex as there are of Agaricus. Nearly two hundred and fifty species of Agaricus have already been detected in this state, and doubtless there are twice that number in the United States. In the Epicrisis of Fries, nine hundred and eighty species are described. Probably no other botanical genus contains as many species as the genus Agaricus. So numerous are they, that when an undescribed species is found, it is not always easy to select an appropriate specific name for it, to such an extent have the available names been preoccupied. Indeed, it seems quite clear, that the necessities of the case, will soon require that the subgenera of this unwieldy genus be raised to genera. Some idea of the difficulties experienced by the celebrated Fries, in his early study of this genus, may be formed from his introductory remarks in his Systema Mycologicum. He says in substance, when I commenced the study of this genus the species were vague, the definitions inadequate, the descriptions repetitious, and scarcely a tenth part of the synonymy was accurately determined. Behold, candid reader, in this work the fruits of the labor of ten years.

The variations in the species are sometimes exceedingly perplexing. Two or three common varieties of the fly agaric, *Agaricus muscarius*, are so well marked as to suggest the question of their specific distinction. They vary in color, in the character and consistency of the warts, and especially in size, the pileus being sometimes one inch across, sometimes ten; the stem varying from one fourth of an inch to nearly two inches in diameter. Equally

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wonderful are the variations in the honey agaric, *Agaricus melleus*. In these plants, favorable conditions seem to transform pigmies into giants.

Another difficulty is found in that singular phase of life called *dimorphism*. It is by no means of rare occurrence among fungi, yet it is not always easy to trace the connection between the dissimilar forms. Especially is this the case when the two forms are developed on different supporting plants or when they are increased to three or four distinct conditions. In many instances these dimorphic forms were at first described as distinct genera and species, but more recent investigations are tracing their specific union and rapidly reducing the number of so called species. It is manifest therefore that the science of mycology is to a certain extent unsettled and as it were in a transitional state. What is needed is the elimination of these superfluous genera and species as soon as possible or rather their incorporation with and union in permanent ones. This will go far toward simplifying and systematizing the science. Such work might be hastened by a series of experiments, but, owing to the extreme tenuity of the spores and the invisible manner in which they are disseminated everywhere by air and wind, experiments are difficult and very liable to error. It is for this reason that some eminent mycologists receive with hesitation and evident distrust the conclusions drawn from the inoculating experiments of Prof. Œrsted, Hoffman and others.

In flowering plants there is a certain degree of permanency of existence and location that enables us to make repeated observations on them if desirable. A rare flowering plant may be discovered in some distant locality but the opportunity may be wanting for learning its whole history immediately. The next season we may repair to the locality at the proper season with a reasonable hope of finding the plant and completing our observations. But

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it is not so with agarics. An abundant supply may occur in a given locality one year, and not a single specimen be found there the next year. Some species are like some insects, appearing plentifully one season then disappearing for several. Some are quite ephemeral, coming forth during the night and decaying during the day. Others appear only late in the season and continue but a few days, so that it is not always convenient for the observer to be at the right place at the right time.

Besides, the minute size of many fungi brings into requisition the habit of close attention in their study, a careful training of the eyes to detect them, a sharp discrimination of their essential characters and a most patient use of the microscope, faculties that generally require considerable exercise before they can be readily employed. The difficulty with which specimens of fleshy fungi are preserved must be added as an obstacle to be encountered by the mycologist. Of all plants the Agaricini and some algæ are the only ones that can not be satisfactorily preserved by drying under pressure. The former must be dried first and pressed afterwards. Even then they lose much of their color, character and beauty. If we would preserve all their characters the spores must be gathered and a colored sketch made of the fresh plant. To do this requires considerable time, but toilsome methods of acquiring and preserving a thorough knowledge of these things cease to be irksome when the heart is in the work.

The final and in some respects the most formidable hindrance to the American student of mycology is the want of a satisfactory text book or manual of our species, to guide and aid him in his researches. The nearest approach we have to this desideratum is the Handbook of British Fungi, but this being a manual of British species, describes but a part of our species. Such descriptions of species peculiar to this country as have been published,

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are scattered through various magazines, reports and journals, some of which are foreign and not easily accessible or procurable. Some are in Latin only and hence unavailable to many, some were written in the earlier days of the science when microscopes were thought less necessary than now, consequently the spore characters, often very important ones, are entirely omitted, some are so brief that they scarcely serve to distinguish the species in a satisfactory manner.

Such are some of the hindrances to the study of mycology, but instead of operating as discouragements they should act as incentives. Is the field a broad one, there is space for more laborers; is the work surrounded by special difficulties, there is opportunity for the exercise of special talents; has it been passed by and neglected, there are more favorable chances for usefulness, for new discoveries and new additions to our stock of knowledge. It is not the simplest problems that engage the attention of the earnest mathematician, not the most monotonous landscapes that give the most pleasure to the beholder, neither is that science the most attractive that requires in its pursuits but feeble exertion and the exercise of but few of our faculties. In the numerous inquiries for mycological works, in the frequent requests for aid in determining species of fungi and for information upon various matters connected with their study, we think we have sure indications of a growing interest in this branch of botanical science and of the rise of a corps of students and investigators, who will do much toward overcoming all difficulties and placing the mycology of this country in a far more satisfactory condition than that in which we now find it.

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The Water Supply of Albany. By PETER HOGAN.

[Read before the Albany Institute, May 20, 1873.]

The subject of a water supply for large cities, involving as it does not only the pecuniary advantages for manufacturing purposes, fire protection and domestic use, but also the sanitary condition of a community, is a problem which in many cases is rendered difficult to solve.

In its varied condition of vapor, liquid and solid form, water is constantly performing some of the most essential and important functions of nature and of the physical purposes of life. It is ever present in the atmosphere, supplying an essential element in the air we breathe. It is present in our food, both liquid and solid, constituting in some of the latter from 75 to 96 per cent of the total amount. The human body itself has full 50 per cent of water in its formation. It is not sufficient, therefore, in providing for a water supply to simply guard against a Chicago or a Boston disaster.[1] The varied requirements for manufacturing purposes and domestic use, as well as a proper fire protection, should be provided for; but in selecting a source of supply the essential sanitary requirements incident to a densely populated district should be strictly regarded.

The importance of this subject is daily becoming more apparent. Recent investigations have finally discovered the immediate cause of many of the epidemics,— typhoid fever, cholera and other similar diseases, which have long

[1] We have just received intelligence of a terrible conflagration at Isaka, Japan, in which many lives were lost; the fire raging a whole day and night; and also of a still greater conflagration at Hong Kong, China, covering an area of 44 acres of buildings, rendering 5,000 people homeless.

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remained in obscurity, tracing the same directly to the well, spring, or river waters in use.

In a recently published communication upon this subject, Dr. Stephen Smith, Health Commissioner of New York city, says:

"The causation of typhoid fever, though long enveloped in obscurity is now well known. It is one of the so called filth diseases of modern sanitary writers. Its most ordinary exciting cause is air or drinking water befouled with excremented matters."

It is also quite certain that a person suffering from this fever, may himself infect the air of his room or the water which receives his excreta with germs of disease so as to transmit it to others.

The facts illustrating the origin of typhoid from excremental matters in drinking water are now very numerous and very instructive.

The following examples illustrating the methods of communicating the fever are presented by Dr. Smith.

"In a small German settlement in the upper part of the city there was a severe outbreak of dysentery and typhoid fever. A physician, called to attend some of the cases, set to work to find out the cause. On inquiring as to the water supply, he was directed to a spring, on low ground, in the midst of the settlement, so situated as to receive the surface drainage. The water was pure and sparkling to the sight and taste, and was loudly praised by the owner of the spring. A quantity put in a bottle and allowed to stand a few hours threw down a thick sediment of most offensive matter. The people ceased to use the water and the epidemic ceased at once.

"In a neighboring village typhoid fever broke out and prevailed with great violence in a given locality. Search was then made for the cause, by the attending physician, but in vain. He appealed for aid to the health authorities

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of New York; and an expert officer examined the history of the outbreak and the locality and predicted that a certain hydrant which supplied the victims with drinking water communicated at some point with house drains or the sewer. The water pipe was examined, and at a distance from the hydrant a house drain was found to communicate with the same. The necessary repairs were made and the epidemic ceased."

The Medical Department of the London Local Government Board, have just issued an important report on the cause of typhoid or enteric fever in London: of the various ways in which water may be made the vehicle for distributing the fever. The report gives the following as illustrations:

At Terling Place ten persons were attacked with enteric fever, and all these persons, and these only of a large family drank water from a particular well into which it was discovered that a cesspool leaked.

At Dickens Bonet in Essex, a certain well was polluted and out of eighty-eight drinkers from that well, forty-two persons were attacked; while only one other person out of a population of two hundred and six in the village, was attacked. At Nunnery, a village in Somersetshire, having a population of eight hundred and thirty-two, Dr. Ballard records seventy-six cases of enteric fever as occuring in four months. The cases were limited in a remarkable way to families who obtained their water supply from a small rivulet which received the sewage of several houses up stream. At Hawkesbury Upton, in Gloucestershire, a village of six hundred and forty-seven inhabitants, within a short period ninety-five cases and fourteen deaths from enteric fever occurred in groups, following the successive pollution of different wells in the village. Burbage, a village in Leicestershire, as recorded by Dr. Guinne Harris had an outbreak of enteric fever from the same cause last year.

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No one took the fever in the village except persons who certainly or presumedly drank water from a particular pump and every house supplied from this pump was subject to infection.

It has been estimated that upwards of 150,000 people are annually affected by typhoid fever in England.

In speaking of the cholera which visited London in 1848–9 and 1853–4, a writer upon this subject says: "The influence which the purity or impurity of water has upon the health of people using it was strikingly shown during the above periods. The Lambeth company pumped water from the higher parts of the Thames and the supply was equal to any furnished at that time by the other companies.

The Southwark and Vauxhall company drew their supply from lower down the river and the water then furnished by them has been stated to have been the filthiest stuff ever drank by a civilized community."

The Lambeth company supplied 24,854 houses containing about 166,906 people, and among these the deaths from cholera amounted to 611, or were at the rate of 0.37 per cent of the population. The Southwark and Vauxhall company supplied 39,726 houses, containing 268,171 inhabitants of whom 3,476 died from cholera. The death rate being, in this case, 1.3 per cent or about three and one-half as high as in the districts supplied with purer water.

That the difference in the mortality in the two districts mentioned was mainly due to the difference in quality of the water supplied to them is curiously corroborated by observations made in 1848–9. At that date the water furnished by the Lambeth company was worse than that supplied by the Southwark and Vauxhall company, and the proportionate death rate in the former, was then greater than in the latter district.

In 1866 cholera carried off at least 10,000 of the population of London; while Glasgow, Manchester, and Sheffield,

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supplied with pure water, were comparatively exempt from the scourge.

Mr. Chairman: The limited time allotted to this paper will not permit further examples of the evil effects produced by an improper water supply, excepting as it is connected with a branch of the subject in which we are now interested.

The history of all large cities which are the centres of commerce and trade are identical in many particulars. Their gradual growth from the plain and insignificant hamlet with narrow and contracted thoroughfares, into densely populated districts, have of necessity carried with the same certain improvements, prominent among which has been the introduction of pure water from points, sufficiently removed from the natural sources of contamination.

Rome in her palmy days constructed immense aqueducts. The first of which, Appia Claudia, was built B.C. 331 years, conveying the water from a point eleven miles distant. Subsequently other aqueducts were constructed conveying water fifty seven miles to the imperial city.

Rome had nine aqueducts, whose aggregate length was 255 miles, affording a daily supply of 377,000,000 gallons. Three of these supplied modern Rome, viz: Aqua Virginia, constructed 22 years B. C.: Aqua Felice, 146 years B. C.. and Aqua Paoli, A. D. 14.

Ancient Rome has furnished us with many lessons in sanitary science: but Rome of the present day, through successive political changes, the ravages of war, and neglected sanitary requirements "lies beneath a pestilential pall, and death is borne on every breeze which is wafted over the once proud capital of the Cæsars."

In stating that the history of all large cities are identical, it is particularly so with reference to the sanitary requirements embracing a proper water supply. Gradually but surely, as the limits of a city become extended, the well,

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spring and river water become contaminated, and are rendered unfit for domestic use.[1]

Paris, the pioneer city of modern improvements, in addition to her double system of spring water and river supply, has recently completed a second aqueduct over sixty miles in length. Madrid and Glasgow have followed with similar improvements, and London, as a matter of absolute necessity will soon be compelled to construct an aqueduct from the Welsh mountains, one hundred and eighty-three miles distant, or from Ulswater near Cumberland which is two hundred and forty miles from the metropolis.

Repeated and constant attempts have been made both in England and in France to mechanically purify the river waters by filtering and other processes, but notwithstanding the great amount of time, skill and labor employed and the expenditure of vast sums of money, protected by acts of parliament, and subsidies from numerous wealthy corporations, all these efforts have proved to be unsuccessful.

Dr. Frankland and Angus Smith, eminent chemists, the former for many years, and at present, in the employment of the British government, have frequently reported sewage in the water supplied at the city of London, "after it has passed an act of parliament and the fitter bids of the water companies."

In speaking of the project of dispensing with the present system of pumping, and adopting the gravitating plan, Dr. Frankland says: "The schemes are very costly. Mr. Bateman's plan which is to bring water from the mountains of North Wales is calculated to cost for a supply of 220,000,000 gallons per day, the sum of £10,850,000,

[1] Previous to the construction of the present Albany City Water Works, an analysis was made of the well water at various points. The pump well at the old State House contained 36 grains of organic matter. The well at the Exchange 64.68 grains, and the pump well at the Capitol Park 65.62 grains of organic matter to each gallon of water.

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($52,514,000,00); while the schemes of bringing water from the Lakes of Cumberlund is put down for 250,000,000 gallons per day at £13,500,000 ($65,340,000,00). Now these are startling figures but I imagine that all we have to look at is the simple question:—how much shall we have to pay for the water when these schemes are carried out? Dr. Frankland says: That from the estimates made it actually follows that after expending this enormous amount upon the works, we will be supplied with this very pure water at a less cost than that which we pay at the present moment. In speaking of the present pumping system he says: The gigantic and magnificent engines employed at the present moment for raising this vast volume of water, 100,000,000 gallons daily, are painful for the philosopher to contemplate. You have here a stupendous waste of power in doing over again an amount of work which was previously executed for us gratuitously. The sun, in his prodigality of power, flings up far above the Cross of St. Paul's the daily supply of 100,000 gallons, and we in our imbecility allow it to soil itself by flowing down again near to the level of the sea, and then we erect immense pumping engines and expend 200 tons of coal daily to raise this water a fraction of the height from which we had previously allowed it to fall; all of this will be saved by the proposed schemes." In nearly all of the larger cities throughout the United States where pumping from the rivers has been resorted to as an early and temporary expedient a distant source of supply has followed.

With this history before us, the experience of over 2,000 years, notwithstanding the recent advances in sanitary science, tracing these fatal epidemics, cholera and typhoid or enteric fevers, as they have been directly traced to the polluted spring and river waters in use at other places, the proposition is now made by the Board of Water Commissioners to pump water from the Hudson river.

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In order to fully comprehend this proposition so strenuously advocated by prominent members of that board, a brief description of the present works is rendered necessary.

In 1850 the Hon. Wm. J. McAlpine made a survey and report for furnishing the city of Albany with an abundant supply of pure and wholesome water.

No closer survey or more accurate report was ever made, or has since been made, for a water supply than was presented in that report. The works as constructed embraced a portion only of the water supply suggested in said report; and also of Sand creek, with their tributaries. A storing reservoir known as Rensselaer lake was constructed in part, but was not completed as originally contemplated by Mr. McAlpine.

Another storing and distributing reservoir was constructed in the vicinity of Tivoli falls, on Patroon's creek. These, together with the distributing Bleecker reservoir, were at the time adopted by the Board of Water Commissioners.

A very accurate topographical map was presented with Mr. McAlpine's report, showing the water shed of the Hunger kill, Norman's kill, Lishas kill, Kaikout and other streams of water at various elevations of from 240 to 250 feet above tide water, which were and still are available under favorable circumstances in connection with our present supply.

Mr. S. H. Sweet has recently made a careful survey of the territory and presented an elaborate report to the Commissioners, showing an available supply as follows: From spring streams as above by, gravitation 4,551,889 gallons; by pumping and gravitation 8,674,000.

By adding the Norman's kill to the pumping and gravity plan [see Commissioners' report to the Common Council], 13,899,000 gallons of water can be procured at a cost of $1,555,986 00. These estimates the Commissioners say

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"do not include the water power on the streams below which it is believed would amount to a heavy item.

In relation to this large available supply the Commissioners say; "These large quantities have been given by gauging the several streams; but from the experience of the Patroon's creek supply, comparing the amount given by measurement in 1850 with that actually furnished during the past season, too great caution cannot be exercised before seeking a supply from these streams. It cannot be questioned that both the Patroon's creek and the Norman's kill, with its affluents, are diminishing in their volumes. When Mr. McAlpine submitted his report on the Patroon's creek he gave the flow above Tivoli from June 19th to July 15th, and July 23d to July 30th, at a daily mean of 12,018,831 gallons; and from July 30th to August 24th, at a daily mean of 11,660,268, making from July 19th to August 22th, a daily mean of 11,899,300 gallons; and yet, during a portion of the past winter, although all the water of this city was distributed thrugh the city mains, it fell far short of the quantity required for use. Rensselaer lake failed while the flow of Tivoli receded two feet. In 1871, the waste gate from Rensselaer lake was never opened.

Now, here the Commissioners quote Mr. McAlpine's gauge of water during specified summer months when water is known to fall in copious showers, and complain of a deficiency during winter, without having made provisions for storing the same at proper seasons. Mr. McAlpine's report does not need any defense; on the contrary, it is accepted as authority. In a London edition of a work published in 1872 (Samuel Hughes, F. S. G.), on the subject of water works the following notice of this subject is made:

"Experiments were made at two stations on the drainage ground of the Albany Water Works. At the first station, having a water shed of 2,600 acres, it was found that from May to October, inclusive, only 41½ per cent of

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the rain fall was carried off by the streams; but from November to April inclusive, 77.6 per cent was so carried off. This was in the year 1850; but in the very next year, 1851, the streams carried off between May and October inclusive, no less than 82.6 per cent."

Had proper storing reservoirs been constructed, and the suggestions of Mr. McAlpine been carried out for increasing the supply by saving a large percentage of water which is now lost by evaporations, no complaint as to quantity would ever be heard of. Had ordinary care been taken to protect the water shed, and small streams and tributaries from pollution, no just cause of complaint as to the quantity of the water need to have been made.

The city, by purchase from Mr. Van Rensselaer secured the full control of Patroon's creek and tributaries, including the beds thereof, and a protection of 33 feet on each side of the same, paying $150,000 therefor. With this right of ownership, with the full control of all the works protected by stringent laws, the Commissioners have allowed individuals and corporations to encroach upon the lower and most important water-shed, to such an extent as to almost destroy the value of the same, converting a valuable water supply into a sewer for the drainage of large districts, beyond the city limits.

I present herewith a topographical map showing the entire water-shed of our present works, with the encroachments by individuals and the New York Central rail road, which shows the necessity for immediate action in relation to this matter and why an additional water supply is imperatively demanded; inasmuch as the Commissioners now look to the river, the waters of which have become contaminated with the poison of our sewers, augmented with the filth of other cities, and ask for an appropriation to carry out their scheme. This proposition of the Commissioners has but one recommendation, that of "sufficiency

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of supply," no regard being had to the probable increased death-rate of the city.

The Commissioners present figures of the cost far below the estimates formerly made by Mr. McAlpine and Mr. Sweet, and omit to make estimates for essential portions of the work. Mr. McAlpine's estimate of furnishing a supply of 6,000,000 gallons from the river was:

In 1850, ...	$1,205,280 00
Mr. Sweet's in 1869,.....	1,462,151 90
The Commissioners in 1872,.....	397,000 00

The Commissioners say their amount may be somewhat increased by the rise in the cost of materials. In this amount, however, is not included the sum necessary to purchase lots for pumping engines, and inlet pipe, neither does the report make provision for filtering the water; this necessary expense, they say, it is believed will not exceed the means at the disposal of the Commissioners.

I submit herewith a description of some of the most important filter beds in England, with an estimate of the cost of construction, together with cost of attendance and renewal of materials.

Neither Mr. McAlpine nor Mr. Sweet recommended pumping from the river; but for the purpose of arriving at a true estimate of the cost of construction and of the annual expense of attendance and the renewal of materials for filtering, which the Commissioners acknowledge is necessary, not less than $200,000 would be required for this purpose alone; which, it will be observed, is over one-half of the amount of the Commissioners' estimate.

In view of the exigencies of the case, I would recommend a special meeting of the Institute, for the purpose of bringing this matter properly before our citizens.

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The subject of the paper was discussed, and a special committee, consisting of Mr. Hogan, Mr. Bingham, Mr. Barnes, Prof. Cooley, and Mr. Colvin, were appointed by the chair to report at a special meeting to be held on Tuesday evening, the 27th inst., at the rooms of the Institute.

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A New Form of Rotator. By LEROY C. COOLEY, PH. D.

[Read before the Albany Institute, April 1, 1873].

Rotary motion is of vital importance as a means of developing principles in physics. Optical, electrical, acoustic and magnetic experiments, to say nothing of the numerous well known illustrations of the "Central forces" constitute a series of important demonstrations of great beauty and variety. Until the present, no instrument has had capacity to grasp the necessary conditions of all cases, and consequently various forms of whirling table or rotator, each adapted to special experiments, have been devised.

But notwithstanding their great variety the experiments in rotary motion may, for the most part, be grouped in three classes, viz: *First*, those in which the rotating body must be *firmly attached* to a vertical axis: *second*, those in which the rotating body must be *freely suspended* from a vertical axis, and *third*, those like the Geisler tubes and optical disks, in which the rotating body must be firmly attached to a *horizontal axis.*

To adapt a single instrument to these three classes of experiment, it is only necessary to utilize both ends of the axis of the pulley and to be able at a moment's notice to shift the axis itself from a vertical to a horizontal position.

This has been accomplished as follows: — From the centre of a base of convenient size a single column rises to a height of about two feet. Across the top of this column, and firmly fixed upon it, is a table measuring about twenty inches in length by five in width. Upon this table and fastened to it by hinges is a strong bar of wood, two and

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a half inches square by about three feet in length. This bar carries the driving-wheel and pulley by which the motion is obtained. The steel shaft of the pulley passes through the bar and is furnished with a screw at each end. By this means articles may be firmly attached to a vertical axis projecting either upward or downward as may be most desirable. A hook accompanies the lower end of the shaft from which bodies may be freely suspended. The bar carrying the driving wheel and pulley, being hinged upon the table, is held firmly in place by a catch. By sliding this catch, the bar turns upon its hinges, carrying the wheel and pulley with it, and thus throws the shaft into a horizontal position, instantly adapting it to receive attachments for optical disks, Geisler tubes or other pieces which must rotate in a vertical plane.

It does not seem that this rotator needs to be essentially more costly than the old style of whirling table; that it has capacity to receive attachments for all varieties of rotary motion in illustrating the different departments of physics would seem to make it more desirable than any hitherto devised.

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Detection of Heat by Convection. By L. C. Cooley, Ph. D.

[Read before the Albany Institute, April 1, 1873.]

In the course of a series of experiments on certain electrical actions, the electroscope in use, which was one of Coulomb's form, gave some anomalous and unexpected results. Its needle would respond with great promptness to the attraction of all the usual electrics, but what was, for a moment, a little puzzling, was the fact that it would swing with equal alacrity whenever such good conductors as iron and copper, after gentle friction, even while held in the hand, were brought into its vicinity. Evidently under such circumstances the motion of the needle could not be due to any electrical action: it was quickly seen to be caused by the gentle rise of temperature in the solid rubbed. So gently warmed by friction the metals became centres of disturbance in the air. The cooler portions around flowed toward the heated centre to take the place of the lighter air pushed upward. The pith ball of the electroscope, caught in these delicate currents, was wafted toward the body introduced. Its motion, therefore, declared the presence of the heat.

Can this principle be applied in the construction of thermoscopes? As one step toward answering this question, a very slender glass tube, five or six inches long, weighing a few grains only, was suspended by a single fibre of silk, about a foot in length, attached so as to balance it in a horizontal position and hung within a glass case to protect it from air currents. An opening was left in the cover for the introduction of the body to be tested and a

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graduated scale was placed under the needle to measure the motion produced.

With this arrangement some very encouraging results have been obtained. The following examples will serve to illustrate: The end of an iron wire after an almost momentary pressure between the fingers, held near the needle, quickly drew it out of place. A hammer falling by its own weight through a distance of 15 inches and striking upon the end of the wire, evolved so much heat that the needle was wafted through an arc of 60°. A small glass tube gently rapped upon the edge of the table and then placed inside the instrument gave motion to the needle, distinctly seen by the most distant member of a large class.

Next to the expensive *Thermo-pile* this *Convection Thermoscope* is probably the most delicate indicator of heat at present known.

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Annual Report of the Class in Philology, Ethnology and Anthropology. By Wm. Hale, Ph.D., Chairman of the Class.

[Read before the Institute, Oct. 15, 1872.]

In presenting the first annual report of this new department of the Institute, it is hardly necessary to attempt any apology or *raison d'être* for the formation of a special class for the advancement of this kindred group of sciences, which are in the highest degree humanitarian. I say *sciences*, though it is not many years since philology could first be called a science, and even now there are those who will contend that there is really no *science* of language, but that science is a term applicable only to the group of studies which are more strictly defined as natural sciences. Language, however, has been proved to have its own laws of growth and development, and the study of these laws has been reduced to a method no less philosophical than that which prevails in the study of material organisms.

To the philosophical study of language, especially in its connection with archæology and the development of the human race, much of the best thought of our age is devoted. These studies received their first great impetus from the discovery of the Sanskrit language, and from the recognition of the Aryan family of languages, of which it is the oldest type surviving; and the patient labors of philologists are adding continually to the means of pursuing them. In Europe, the great Sanskrit lexicon of Boehtlinck & Roth, published at St Petersburgh, affording a vast thesaurus of information hitherto inaccessible to scholars, is approaching completion after the labor of twenty years, having but four

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more letters to complete; and Monier Williams's Sanskrit and English dictionary is just published, being the first complete Sanskrit and English lexicon ever issued, and new works grammatical and critical, as well as the publication of Sanskrit texts, have been numerous. In our own country, Professor W. D. Whitney, of Yale, has contributed extensively to the journal of the American Oriental Society, especially as regards the grammar of Sanskrit, and the Vedas and Vedic, or old Sanskrit, as well as more popular works.

The problem of the origin of language has not lacked discussion, and, while the beginnings of human speech are of course forever lost in oblivion, yet there is much in the earliest forms of language known to us that may be considered as helps to lead us towards the knowledge of still earlier times: and the study of the speech of the lowest types of manhood now existing may reasonably be resorted to, for the further increase of this knowledge.

Passing now from the earliest to the latest, and from the study of language in general to that of particular languages, the most casual observer may note throughout the world, with increasing international communication, an increasing knowledge of foreign languages in almost all countries; and notwithstanding all this polyglottism, the more dominant power and the world wide diffusion of our own English language, at the expense of all others. With the knowledge of our arts and sciences we are extending also, and especially in the Orient, the knowledge of our language as the vehicle in which these ideas are conveyed; and while Cornell university contains one professor of Chinese and Japanese, Japan contains numerous teachers of English, and even now the project of introducing the English as the national language of Japan is under consideration. With the Pacific railroad there comes to us Americans also, a wider dissemination, not so much probably

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from the Orient as from the back-woods of our country, a wider and more rapid diffusion of slang, painfully intensified by the literary productions of such writers as Bret Harte, who, despite his genius, and even by the mere force of genius, has done too much to corrupt the purity of our noble Saxon.

This is no age for idleness or stagnation in any department; live questions in the study of languages will be agitated continually. Perhaps the question now most prominently before the public mind, and especially among educators, is that of the relative importance of ancient and modern languages. Is it not, we are often asked, better to begin with the study of spoken tongues, therein acquiring a knowledge of practical benefit, and from the knowledge thus acquired to ascend if desired to the ancient and now obsolete forms of speech? This question will doubtless long continue a fruitful theme for discussion, and perhaps without receiving any authoritative answer will result, as in fact it does practically result now, in a compromise.

The second branch of our subject, the department, namely, of Anthropology and Ethnology, seems in the *scientific* development of it almost as new as the science of language. Man upon earth! how long have his condition and development been objects to be scientifically scrutinized? How far, in fact, can science even now pronounce a conclusive verdict on the numerous questions pertinent to this sphere of investigation? Take the very initial question of polygenesis and monogenesis, the unity or diversity of races of men, whereon doctors disagree, who shall decide it? Then, as regards the development of man, – especially primeval man; we find on the one hand Lyell, Lubbock, Huxley and others, holding that the status of the lowest forms of savages known to us is typical of primeval man; and on the other, a host of names, including among them profound thinkers, who as absolutely refuse to accept the theory of

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the development of man physically and mentally, and especially morally, as they do to admit any portion of the evolutionary theory as illustrated in cosmogony and biology. History presents us, it is true, with undoubted examples of the retrogression of nations and races; but she also records from the earliest time known to us, progress somewhere; some nation always leading the van, and being for the time, the centre of civilization and progress, not perhaps marked from year to year, but certainly from age to age.

The nearest approach to primeval man, among the extant tribes known to us, is found in Australia. One striking similarity between the Australian and primeval man, is the use of the boomerang. Colonel Fox, at the August meeting of the British Association for the Advancement of Science, maintained that this connects Australia with the Egyptians and the Dravidians, the latter being the native tribes of India, that is the tribes which inhabited India at that remote time when the Aryan invaders had not yet intruded there, and Huxley also shows that these races are traceable in their bodily structure to the Australoid stock. Colonel Fox also refers to the *Journal* of the Anthropological Institute, vol. 1, No. 1, for July 1871, to prove that several investigations have traced a connection between the Australian and Dravidian languages; and further, in practicing with a *fac simile* of the Egyptian boomerang, from the British Museum, he succeeded in obtaining a slight return of flight; and he concludes his argument with the statement that "to deny the affinity of the Australian and the Dravidian or Egyptian boomerang on account of the absence of a return flight, would be the same as denying the affinity of two languages whose grammatical construction was the same, because of their differing materially in their vocabularies. Now the Egyptian and the Dravidian were early races of men; and if we accept the argument from the similarity of these races with

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the modern Australians in their anatomy, their language, and their arts and weapons, we must regard the Australians of to-day as the specimens of living men of which these extinct races are the fossil specimens, and we should expect to find now living in Australia the type of primeval man. What discoveries may await us on the full exploration of Africa, it is as yet premature to conjecture. The almost incredible accounts received from Dr. Livingstone relate merely to fluviatic explorations, and touch but slightly on the characteristics of the inhabitants of regions visited by him.

The interest with which these studies are now regarded is evident from the number of new books fresh from the press, among which may be mentioned Evans's *Stone Implements of Great Britain*, Dr. L. Buechner's *Man in the Past, Present and Future*, translated from the German by Dallas, and a whimsical work entitled *The Martyrdom of Man*, by Winwood Reade. Both the latter are written in a thoroughly sceptical tone, and are bitterly opposed to Christianity. Dr. Buechner is lecturing in this country this season.

The search for ancient monuments and relics of primeval man is also vigorously prosecuted, and with much success. Implements and fossil remains in abundance reward the diligence of collectors. A recent newspaper account represents a mound on the line of the Northern Pacific railroad to contain evidences of a race of men different from any previously known to have existed in this country. Whether this will prove to be a discovery of any value cannot be determined, however, without fuller information than I have yet been able to obtain.

The monuments of comparatively recent times, that is to say of the date of earlier civilization, are also rapidly accumulating. Such histories as Mommsen's Rome and Curtius's Greece, for instance, could not have been written till very lately; and in the Levant the discovery of the

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Moabite stone in 1870, gives us the earliest yet discovered specimen of any Semitic writing and the most primitive form of the alphabet, though even that is evidently descended from some still earlier one, and shows traces of divergence from the primitive form which was the common mother of it and of the other Semitic and Aryan alphabets. One of the most attractive features in popular interest at the meetings of the department of anthropology of the late Brighton meeting of the British Association, was the exhibition by Mr. Evans of a series of charts showing the successive changes in alphabetical characters from the original hieroglyphs in the form of an ox, a house, a camel, a door, etc., to the form of letter as indicated by modern printer's types.

Monsieur Quetelet has shown by careful compilation of statistics that as regards all matters pertaining to the conduct of mankind in social relations, as well as to the structure and proportions of the human body, uniform laws prevail. Thus it is proved that in a given number of men of the same race taken at random, a certain proportion will be of the height of 5 feet 8 inches, which is the mean height of the Anglo-Saxon race, and the proportion of men, of all different heights above or below that standard remains the same, and varies from the number of those of the standard height by a law of mathematical relation.

The same thing is observable with regard to girth of waist and of other corporeal measurements. Stranger still, it is found that the proportion of insane persons to the entire community, though varying somewhat from time to time, follows on the whole a mathematical relation; and the same is true of the proportion to each other and to the number of the entire community of various kinds of crimes committed. So, also, of the proportions of marriages of persons of different ages, a mathematical uniformity is found to hold good in the mass, notwithstanding all the caprices of individuals. Thus it appears that in all the

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affairs in which individuals seem least controlled by law and most free to act their own caprice, yet in the community, as a whole, there exists a proportion as exact as if the most inexorable laws compelled each one to the performance of every action, and this relation between every kind of action and the number of persons who will engage in it may be expressed in curves for which a mathematical formula can be obtained, in which the ordinates shall represent the number of persons of each class, and the abscissæ the degree or kind of action performed. I know of no discovery of science more wonderful than this, which traces the operations of law in matters usually thought to be most utterly lawless. An interesting account of these investigations of Quetelet on the Science of Man is given in the May number of the *Popular Science Monthly;* and it is there remarked that though statistics of purely mental actions have not yet been compiled, there can be little doubt that the same laws will ultimately be found applicable to them also. Indeed, without the aid of statistical tables, we may see something of this in the well known fact that every generation produces about the same number of men in each general department of industry, showing, *pro tanto*, an average uniformity in the proportional number of men in the community of all different intellectual and industrial proclivities.

Of the classification of races of men, or ethnology proper, there is but little that I need to say, for, so far as I have been able to learn, no final and complete classifcation has yet been attained, nor am I aware of any special works on this subject very recently issued.

It will be seen that the range of topics belonging to this class of philology, ethnology and anthropology is a wide one, and in the highest degree interesting. "Know thyself" is a maxim which became almost the shibboleth of a system of philosophy, and which is certainly the only genuine foundation of all philosophy. Subjective knowledge

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is after all the only knowledge of which we can predicate any positive certainty; for knowledge of all objects is only of objects as they seem to us, and how can we know ourselves without a broad and comprehensive knowledge of our fellow-men as well as of our own origin and development? Whence can we forecast the future but by discerning the impetus and direction given by past momentum? Whereby can we read the future destiny of our race unless in the light of past history?

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Supplement to the Calculus of Operations. By JOHN PATERSON, A.M.

[Read before the Albany Institute, Nov. 3d, 1874.]

Space and Time are the first and oldest things of the terrestrial world. The child sees space in color, and verifies it by the touch. Had Kant remembered the time when he first saw space and verified it, he would have had no occasion to assert its composition by the mind, and therefore would have had no doubt of the *thing-in-itself;* and we should not have been obliged to consider space and time as innate.

The mind certainly sees space in two dimensions. A point is position without magnitude, and when prolonged into a line, it is merely a division, and only imaginarily visible. Assuming a perpendicular axis, the mind projects its vision to a certain distance; and rotating around this axis entirely, the cylinder will be completed. Assuming again a horizontal axis and rotating forward entirely, another cylinder is completed; and thus the whole of space is included. Casting existences out of the way in every direction, we see that space must be infinite in extent.

Assuming a beginning in time, let the Sun be our first station. At distances so great that light would require thousands of years to reach us, the bodies we call fixed stars are placed; these are suns like ours. From the nadir and zenith, from north and south, and from east and west, with unequal densities and at unequal distances from each other, the All-powerful and All-knowing Creator planted material germs. These material germs emanated into space in all directions. Certain limits, more or less approaching

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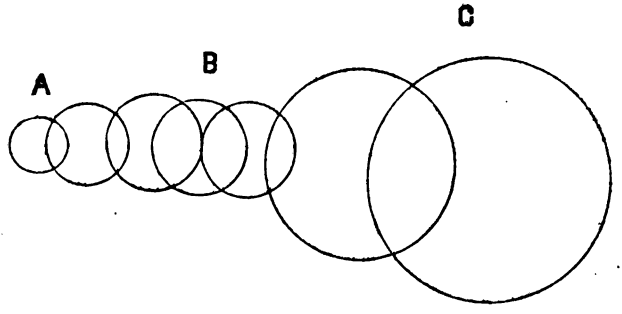
spherical in outline, would be reached between each two nearest emanating centres, where the encountering forces would be equal. At these limits or boundaries both transmission and reflection would take place; that is, there would arise inverse action in both directions, resulting in thin waves. After the manner of waves, this would commence a condensation, followed by a relaxation; another condensation, followed by another relaxation; and so on until the final condensation near the centre. As the distances were unequal, the compression would not be spherical; the pressures would be unequal from different sides, and rotation would be the consequence, giving rise to numerous bodies of various sizes, the planets and asteroids of our system. The waves of relaxation and condensation would serve to explain the cold and hot regions of our globe; for as yet no heat had appeared, but is farther to be explained.

Let us begin with a solid, and apply heat to it. It takes 80° of latent heat to melt ice, represented by gradually



increasing circles (A), until reaching the liquid state, when the circles will be uniformly equal, the radii and circumferences being at identity (B). Continuing the application of heat, the circles enlarge, until the circumferences touch,

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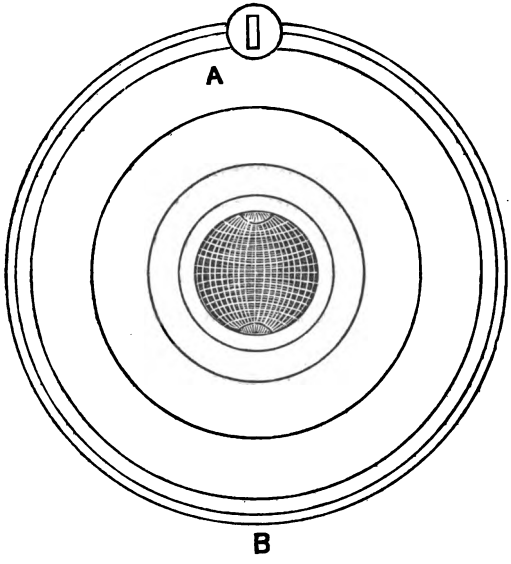
and finally the arc becomes a straight line (c), and the state of steam or gas is achieved by the aid of 540° of latent heat.

If two bodies are of unequal temperature, the greater will yield to the less until they become equal, when they will exchange equal quantities; so that matter always emanates heat.

The globe of the earth emanates heat in all directions into space. At a given distance from the surface of the



earth, suppose a small body (A) let loose; it emanates a small portion, which breaks the emanation from the earth; an equal quantity of emanation equilibrates on the opposite side of the earth (B), which causes the body to fall. It is instantly taken up by the next emanation; and so on, and describes a square. Every break of the original arc is instantly transmitted to the opposite side and pulled by

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virtue of its force; the equilibrium is disturbed through the circumference, as follows:

Nos.	Diff.	Sq's.
1	1	1
2	3	4
3	4 5	9
4	9 7	16
5	16 9	25
6	25 11	36
7	36 13	49
8	49 15	64
9	64 17	81
10	81 19	100

The first differential is one. As it increased uniformly, its amount would be two in the second time, increased by one as the original genesis, to which add the square 1, making in all four; the sum generated in the third time will be five, to which add four, making nine, etc. The last column will be the squares.

When a ball is struck, the force from the centre to the circumference is annihilated, the opposite force is equilibrated, and carries the ball away; thus inertia is explained.

Take two tubes each about a foot in length, both open at one end, and one open and the other shut at the other end; blowing into each, the open tube will sound twice the intensity of the shut one. The former has a node at the origin and a venter at the extremity; the latter has a node at both ends, and a venter in the centre.

Comparing this example with the former one of motion, we find they both agree to make the operator and his instrument the node, and the venter the result of his effort. We will make this a general rule.

The sun is a node, and its venter is its extreme border of emanation; outside of the sun are the other suns of the universe, which have like nodes and venters. Within the sun's jurisdiction, there are many nodes and venters, each planet, etc., being one pair.

In the case of motion, the operator is a node, and terminates at the centre of the ball, which, of course, is a node, with venter at the extremity of its motion.

If we take a piece of iron and a hammer, and strike the iron repeatedly, it produces heat. Or better, take two pieces of hard wood and rub them together until they take

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fire; this is the way that fire was first obtained by man. Here the node and venter are discovered in the operator and his instrument, the wood. If the operation be prolonged sufficiently, light is produced, and if the result be turned into a circular prism, like Newton's rings, it will be decomposed into seven luminous rays and one actinic ray, partly reflected and partly transmitted. This will represent the sun's ray or pencil of light. If the inclination be sufficient, the ray will be divided into two, ordinary and extraordinary.

We will modify the shape of the instrument by taking a plate of glass, or some substance so thin as to have but two sides. Support it by its centre of gravity, and apply to it a cushion of some soft material, and rub it very gently. There will appear positive electricity on the opposite side, and negative electricity on the same side, provided both sides are connected by a conductor. This is exactly equivalent to decomposing a sphere of heat; and thus electricity is a split force, each opposing the same, and attracting the opposite. When coming together, they produce heat and light again. Here the node is distinguished in the operator, and there are two venters, a positive and a negative. In the decomposition of light, it was divided into two, like the positive and negative, and they united by complementaries, giving a square.

Referring back to figure B, which we know represents water, with equal ratios of attraction and repulsion, so that nodes and venters are at identity; let our operator take a liquid of higher intensity than water, of course it will have a higher attraction and repulsion, and will disturb the equilibrium of the water. As water is a thin substance, having but two sides, positive electricity will occur on the opposite side and negative on the same side; the like will occur on the next particle, and so on until reaching the border, on which will appear an amount of positive electricity and negative on the opposite side: a split force. The positive

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electricity will repel positive and attract negative, producing heat and light.

Magnetism results from the application of electricty to iron.

Our sun is a singular and the double stars or suns are probably positively and negatively electrified.

Vitalists have been too fast in attempting to produce life from one element alone. They should know that carbon, hydrogen and oxygen, at least, are requisite to produce life. We see that some simple minerals try to simulate the effects of life by crystallization, such as ice, snow, urea, etc. But for a true hatch we must have multiple elements. Life began at the bottom of the sea, where the first deposit was simple, and the circumference very hot. The first generation of animals was very simple and soon destroyed. Their decay left a more generous deposit, which in turn was destroyed and a further improved deposit was the result, etc. After a sufficient time had passed, the deposit had reached the highest perfection, and the surface of the earth had cooled sufficiently, the race of man appeared on a low stage.

1. Take carbon, hydrogen and oxygen; they would form a unit, which, being very small, would divide into two, a positive and negative, which would soon separate and germinate in spherical form. Arrived at the external medium, they would form the vegetable world, male and female.

2. Take carbon, hydrogen, nitrogen and oxygen; they will form a unit as in No. 1. As the result will be very small it will divide into positive and negative as before, and they will develop into animals, which, according as they live in the sea, or on land, or in the air, will become fish, or animals, or insects, or birds, or finally MAN.

Our primary node will be the heated and darkened interior of the earth, and the venters will be near the surface. As they come to the surface they meet improving germs

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with improving conditions, until finally trees and animals, and lastly man is made. By this there will be improved conditions, such as the absence of a tail, improvement of throat and tongue, articulate speech, and of the head generally. These things do not appear in any of the inferior animals.

It requires two persons to make one bargain. It takes two forces to give one resultant. This is seen in all the previous examples, and it appears in no preceding philosophies. Had our ancestors devoted their attention to this fact, instead of giving the whole strength of their minds to ancient languages and Aristotelic logic, we should have been spared the pains of writing innate ideas.

In this little tract (which shows my feeble health) I have brought every thing from one single principle, that of emanation or repulsion, which I have shown does not contradict the other forces, but is in complete harmony with them, to wit: motion, sound, heat, light, electricity, magnetism, and lastly, life itself, both vegetal and animal. In all these, except the last, I have made man the first mover, typified as a node which terminates at the nearest circumference as a venter, which then takes course until the centre, which of course is a node, whence the node carries forth to the final circumference or venter.

For the last case, the earth is the first node, and generates life at its venter or circumference. Matter is not dead, but emanates constantly, and generates life positive and negative, vegetal and animal, in the dark and moist bosom of the earth, and shoves the result forth to the surface. The vegetal and animal grow by feeding, and their existence dies by exhaustion and wearing.

I have drawn everything from heat, which the earth always emanates, and will, we trust, be found sufficient to furnish all the *energy* required. Those who live in glass houses should not throw stones at the passengers.

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For magnetism, chemistry, electricity, etc., etc., refer to the work of which this is a supplement.

Although what follows is in the work to which this is a supplement, we deem it necessary to repeat it here. It is known that a force of the first degree produces a linear event; of the second degree, a square; and of the third degree, produces a cube. But a chemical phenomenon has three dimensions.

CUBES.

1	8	27	64	125	216	343	512	729	1000
	7	19	37	61	91	127	169	217	271
		12	18	24	30	36	42	48	54
			6	6	6	6	6	6	6

The irregularities may be owing to electrical disturbances.

JOHN PATERSON, A. M.

Albany, Oct. 24, 1874.

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Notice of Peter Hasenclever, an Early Iron-Manufacturer. By HENRY A. HOMES, LL.D.

[Read before the Institute, April 7, 1874.]

The name of Peter Hasenclever is worthy of notice on account of his expensive enterprises in this state, previous to the revolution, in the manufacture of iron and to obtain products of the soil for exportation; and because it is his name which is perpetuated to this day in the Hasenclever mountains in Herkimer county, in the title of the Hasenclever land patents, and in the Hasenclever iron mine in Rockland county.

Peter Hasenclever, sometimes called Baron Hasenclever, was a German, born at Remscheid in the Rhenish provinces, in 1716, who had been a partner in a mercantile house at Cadiz, in Spain. On account of the climate, which was unfavorable to his wife's health, he went to London in the year 1763, where she had been living since the year 1757. There he formed a partnership under the firm name of Hasenclever, Seton & Crofts, with a joint capital of £21,000. He soon induced a respectable company of persons — Major General Greeme, Commodore Forest, George Jackson, secretary of admiralty, and others — to agree to spend from £10,000 to £40,000 in the production of pig iron, hemp, pot and pearl ashes in North America.

The agreement was made in January, 1764, and by June of that year he himself reached New York, and by November there arrived at the same port, hundreds of Germans — miners, farmers and mechanics, with their families — whom his agents had engaged in Germany. As at this time his land and his mines had not been bought or selected, no candid judgment can hesitate to regard him as

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manifesting at the very outset a rashness and want of calculation, through which the capital at his disposal might be imperiled and sunk, from many natural yet unexpected causes.

Yet such was the energy of this sanguine man that he actually made iron at a decayed iron works by the month of November, 1764, and had purchased in New York and New Jersey 50,000 acres of land for his purposes, on the account of his company In August, 1765, he purchased a ship in New York, which he loaded for London, with iron, furs, timber, and potash to the amount of five hogsheads. The iron and the potash had been manufactured by the company's workmen.

Within a year from November, 1764, he had transported 535 persons, including their wives and children, from Germany, as miners, carpenters and laborers: and his partners in London also wrote to him that "it was universally allowed by the trade that his iron was the best drawn which had ever made its appearance on the London market from America."

At the end of the next year, 1766, he had in operation four furnaces and seven forges in New Jersey and New York, and a pot and pearl ash manufactory on the Mohawk river, and had built stores, work-shops and dwelling houses to the number of 235, besides dams for thirteen mill ponds and ten bridges, with many miles of roads.

These furnaces were on the Pequonnock river at Charlottenburg, and Ringwood and Long Pond in Bergen and Morris counties, New Jersey, and at Haverstraw, Orange county, New York, all of them being near the line of the Erie railroad as it is now laid out; and one was at Cortland, in Westchester county. Several of the mines which he then opened, and upon which he spent large sums of money in developing them, are still worked, and are greatly productive. He examined in all fifty-three mines, of which he asserted that only seven proved to yield good ore.

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The one at Cortland was on the east bank of the Hudson, in the town of Cortland, near St. Anthony's Nose. This furnace was early abandoned because the ore proved to contain too much sulphur, as did the ore of the sixth furnace in the highlands, forty miles above New York, near Haverstraw. The mine to this day is called Hasenclever's mine, and is now worked by the Bayards of Philadelphia.

Previous to Hasenclever's operations, the only notices of iron manufacture in the state of which I have knowledge were at Ancram, in Columbia county, and the Sterling works in Orange county. There were no rolling or slitting mills at that time, as they were forbidden by the British authorities to the colonists. Gov. Delancey, in 1757, states that from 1750 to 1757, the quantity of iron produced by Robert Livingston at Ancram was in all about 2,000 tons, and that it was the only place where iron was then smelted in the state.

The Stirling mine, in Warwick, Orange county, was purchased by Lord Setrling in 1750; and in 1751, Messrs. Ward & Colton commenced making iron from the ore, and in 1752 the first forge was erected there; but work was soon temporarily abandoned. At a later date Peter Townsend, formerly a merchant of New York, worked the Stirling mine, and continued to do so for many years. He was the forger of the Hudson river chain at West Point. There is in the possession of Gen. Franklin Townsend a piece of iron casting, the back of a Franklin fire place, having the date of 1767 upon it, with the letters "A. T., New York;" probably meant for A. Targee, of N. Y., an iron founder.

Hasenclever's pot and pearl ash manufactory was at New Petersburg, near the German Flats, on the Mohawk, where he had built two frame houses and thirty-four log houses, and had a fine settlement begun for the cultivation of hemp, flax and madder, in addition to his other enterprises.

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A gentleman spending money so liberally as Hasenclever most naturally had the acquaintance and aid of the leading gentlemen of the colony. Accordingly Gov. Moore, Gen. Gage and Sir Wm. Johnson gave him every facility in obtaining land by purchase or by patent, and Sir William became equal partner with him in the potash manufacture. What he had actually done in importing emigrants was a sufficient warrant of what he would be able to do in the future, in bringing a much larger number and thus enhance the value of land to all holders of it.

During this period of his buoyant hopes he developed great commercial schemes in his correspondence with Sir William, in which the usual sagacity of the latter forbade him to engage. One scheme was a proposal for the formation of a trading company, that should have a monopoly of all the trade with the Indians—on the plausible plea of protecting them from all injustice in trade. Another was for exclusive privileges as distiller of spirits and in the manufacture of salt, by which it was alleged a large addition would be made to the revenues of the colony.

The enterprises in which he was actually engaged were such as, if sustained by these authorities, would commend them to the government at home for their zeal. The "Society for the Encouragement of the Arts, Manufactures and Commerce" at London, had in the year 1764, as in other years, offered premiums for the production of these very articles in the North American colonies, which Hasenclever had undertaken to produce — iron, madder, hemp, pot and pearl ashes.

In the short space of two years Hasenclever spent, according to his own admission, £54,600 on account of the company, being £14,000 more than the company was ever pledged to be responsible for. The credit side of his account showed little in his favor. Though the iron was good, there had been very little sent over to the London market. Freshets had carried away his dams, one of

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which was 860 feet long and twelve feet high; roads and bridges had to be built; an incompetent manager who had been sent over to supplant him had made useless and very expensive changes while Hasenclever was on a visit to England; and the ore of some of his mines on which he had expended much labor contained too much sulphur to be profitably melted. Besides, he had justly quarreled with and separated from Rupert, his potash manufacturer; and his potash did not turn out to be of prime quality, and sold at a loss in London. Thirty pounds of hemp seed which he had imported from Europe and sowed, yielded no returns.

While he was struggling with ardor and hope against a thousand obstacles to immediate success, he learned in October, 1766, that Seton, one of his partners, was a bankrupt and had wasted the capital of the company, and that his commercial house had been fraudulently sacrificed. He succeeded, however, in making an arrangement with his co-adventurers for the continued prosecution of mining in America, and came again in 1768 to New York as their agent. But the new manager of the works whom they had sent out was utterly ignorant of the business. His difficulties here and in London increased, his bills were protested, and he proceeded in 1769 to London for the last time. He represents in his statement of his case that the American Company, sometimes called also the London Company, was engaged in an unworthy clandestine conspiracy against him, and that it was by their machinations in 1770 that he was declared a bankrupt. Indeed, Lord Hillsborough, secretary for the colonies, at their solicitation, wrote to Gen. Clinton to sustain the new manager of the company against the interference of Hasenclever.

In part that he might be able to justify his proceedings before the Court of Chancery, Gov. Franklin of New Jersey, by official request appointed a committee consisting of Lord Stirling, Col. John Schuyler, and others to visit all

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his works. They testified to the perfection of his iron works, to the superior quality of his iron, and to the many improvements in the methods of manufacture which he had introduced, some of which were afterwards adopted in England. And one particular which they mention, to quote their own words, is the following, which is strange if true: "He is the first person that we know who has so greatly improved the use of the great natural ponds of this country, as by damming them to secure reservoirs of water for the use of iron works in the dry season, without which the best streams are liable to fail in the great droughts we are subject to."

At this time James Rivington, the New York bookseller and publisher, writes to Sir William Johnson (Sept. 16, 1769): "Poor Peter Hasenclever, who in the last five years has buried the better part of a hundred thousand pounds in this country, is now among the unfortunates, being declared a bankrupt. His fate is regretted, for he was honest and well beloved." Thomas, in his *History of Printing in America*, relates that pamphlets opposed to the stamp act were frequently published in 1765 in New Jersey with the imprint "Printed at Peter Hasenclever's iron works;" "a wealthy German well known as the owner of extensive iron works in New Jersey." It was a ruse of the authors to conceal the knowledge of the place where the printing had been done.

As late as 1773 he memorialized the lord chancellor for relief by the court, stating that he was so poor that his wife and daughter were then being supported by the charity of his relatives in Germany.

The landed property of which he was possessed in his own name, or in behalf of the American company, was the 50,000 acres connected with his mines in New Jersey and in Orange county, New York, 18,000 acres in Herkimer county, called the Hasenclever patent, 6,755 acres bought additionally for his agricultural operations close by Ger-

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man Flats, 40,000 acres in Nova Scotia, and 11,500 acres on Lake Champlain north of Crown Point. The land on Lake Champlain he bought jointly with Gen. Gage, Gen. Philip Schuyler and others. His title to this land in Essex county was probably never perfected.[1] As late as 1815, 1,000 acres of this land in Orange county was sold for non-payment of taxes to the amount of $415, which had been due since 1767.

A portion of the land in the Hasenclever patent in Herkimer, which was dated February 27, 1769, was sold by the state for the non-payment of taxes as late as 1822. The land was in the towns called Herkimer and Newport, afterwards Schuyler, and was bounded northeast by Canada creek, south by Cosby manor and Colden's manor, and bordered on the Mohawk river. This land which it was kindly allowed to him to purchase, originally was part of a large purchase of 140,000 acres made from the Indians, by Gov. Moore and Sir William Johnson. He was a frequent visitor at Johnson Hall, and there are numerous letters from him among the Johnson papers in the N. Y. State Library. Gen. Gage, in a letter, speaks of him very favorably to Johnson. In his letters to Johnson, Hasenclever expressed in the strongest language his convictions that it was not for the interest of Americans to engage in manufactures, but only in raising raw material.

During the year 1770 he was endeavoring with much hope and expectation to find purchasers in England for his land that he might get free from his troubles. What became of his lawsuit after 1773, I have no information, other than that proceedings were had in the case in the Court of Chancery as late as twelve years after, in 1785. He returned to Germany, and introduced at Landshut, in Silesia, the linen manufacture, which he conducted with great judgment, till the year 1792, when he died much lamented. In at least one place in this country where his

[1] Watson's *History of Essex County, N. Y.*, Albany, 1869.

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name was in use one hundred years since, it has been corrupted into Baron Hass.

Steel of the finest quality imported into this country from Germany, till a comparatively recent period, was known as the Hasenclever steel. We hope to ascertain whether it was a steel manufactured by our Hasenclever's methods.

It may stimulate a worthy spirit of enterprise that I should copy in conclusion an extract from Hasenclever's *Case* on a silver mine in this state: "I lost also on a share in a silver mine of which Col. Fred. Philips (on whose land it lies, twenty-eight miles above New York) had given me one-sixth, and I went there with some miners to examine it; this mine proves now to be very valuable, and may become in time an immense concern."[1]

Much of the information in this article has been derived from a pamphlet of which I have never heard of any copy than the one copy, which is in the State Library. It contains 97 pages, and is entitled *The Case of Peter Hasenclever*, and was written by himself. It contains many additional statistics as to the cost of production of the articles mentioned in this paper, and the obstacles to success, especially as regards iron: with numerous details regarding his financial difficulties.

It has seemed most proper to make a record of an attempt to develop the iron mining industry in this country at such an early date, and at such prodigal expenditure, which whatever may have been the loss to its originators, has of course enured to the advantage of others. The town and county histories of the places where he lavished his capital, contain no account of the visionary but most sincere Peter Hasenclever.

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[1] An early member of the Institute, Winslow C. Watson, Esq., has kindly suggested to me that this mine is the one which was rediscovered about forty years since at Sing Sing, and as he is disposed to believe near the site of the State Prison. The implements which had been used in ante-revolutionary times were found in the abandoned mine.

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The Geological Evidence of the Origin of Species by Evolution. By Prof. CHARLES CALLAWAY.

[Read before the Albany Institute, December 16, 1873.]

To prevent misunderstanding, let me at starting distinctly define what I propose to do. I express no opinion on Darwin's hypothesis of the origin of species by natural selection. Evolution does not necessarily involve natural selection. All I contend for is evolution in contradistinction from separate creation. Then, too, I do not pretend to present a complete case. I retain myself as counsel to examine only one class of witnesses, the races of extinct beings who being dead yet speak.

Much will depend on our answer to the preliminary question, "What is a species?" Naturalists have generally agreed that a species is that assemblage of animals or plants the individuals of which are fertile. Distinct species either produce no offspring, or their progeny is a hybrid and is barren. It is not necessary that I should discuss this definition, simply because it is quite inapplicable in the present case. We cannot resuscitate fossil forms and command them to be fruitful and multiply. We must, then, seek some other test, and I confess myself in despair of finding one. Let us assume one; let us define a species as that assemblage of living forms which agree in the possession of certain characters which are not collectively possessed by any other assemblage. I presume no one will object to the substance of that definition. Now the unscientific, if there are any here, will ask where is your difficulty? Is not a horse distinguished from an ass by certain characters, and is there any likelihood of con-

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founding the two? This may be true, yet every naturalist knows there are numerous cases in which the limits of so-called species are unfixed and unfixable. What one regards as a species another maintains is a variety. Then individuals intermediate in character between the species and the variety are discovered, and the variety is abolished. New discoveries fill in the gap between two species, and one of the species is abolished. The common Devonian fossil *Spirifera disjuncta* was once eighteen species, but the different forms so graduated into each other that it was found impossible to maintain the old distinction. In this state, there is a fossil which ranges from the Clinton group up to the Chemung, *i. e.*, from the lower Silurian (Murchison's base of upper Silurian) to the upper Devonian. In each formation it puts on certain characters (not always dependent on the nature of the sediment in which it lived) which will enable the experienced geologist to decide the formation by the fossil. This species is described by Prof. Hall as *ætrypa reticularis*. Some palæontologists would make half a dozen species out of it. This is the class of difficulties we meet with in defining species, difficulties which are themselves arguments in favor of evolution, and which, indeed, will lead me to my first proposition.

1. *Fossils fill in many of the gaps which formerly separated living types.*

Let us first enquire the value of such evidence. If, between two living forms, A and C, a fossil combining many of the characters of both be discovered, does it prove that C was evolved from A or A from C, through the intermediate stage B? Not necessarily. The discovery of B simply supplies us with one of the stages by which evolution *may* have taken place, *i. e.*, it removes some of the improbability that two very distinct forms should be connected by actual descent. Take an illustration. John Plantagenet, of Vermont, claims descent from Richard III of England.

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The Vermonter thinks his features are like the pictures of the king, though others do not see the resemblance. But John hunts up a portrait of Obadiah Plantagenet, who came over in the Mayflower. On a close examination, it is found that John has some features in common with Obadiah, and that Obadiah has other features in common with his royal ancestor; and, by means of this intermediate link, a relationship between John Plantagenet, of Vermont, and Richard of York is shown to be not improbable. Now, superficially, no two classes of vertebrata appear more distinct than birds and reptiles. That an eagle should be allied by blood with a serpent seems a wild flight of fancy.

But geology has supplied us with numerous links connecting the two classes. I will take a few examples out of many. The Pterodactyl of the Mesozoic periods is an undoubted reptile, yet it has the breast bone of a bird, the bones were hollow and filled with air, and one of the fingers was enormously prolonged so as to give support to a flying membrane. In *Ramphorhyncus*, an allied genus, there appear to have been no teeth in the fore part of the jaw, and it is probable that the parts were sheathed in horn, so as to form a kind of beak. The order *Deinosauria* consists of Mesozoic reptiles with affinities with the ostrich family, especially in the shape of the pelvis. In South Africa has been discovered a curious order of reptiles, some of which were furnished with a beak-like mouth, and were apparently destitute of teeth. As we have bird-like reptiles, so geology tells us of reptile-like birds. The best known of these is the *Archæopteryx* of the Upper (or Middle) Oolite of Solenhofen. This curious bird was provided with a lizard-like tail, longer than the body, and composed of separate vertebræ, each of which carried a pair of quill feathers. It also possessed two claws to each wing, a character which, whether reptilian or mammalian, never occurs in living birds. Now I do not argue that these intercalations prove the evolution

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of birds from reptiles, or *vice versa;* but I contend that they prodigiously lessen the improbability of such development; they supply us, at least, with some of the steps by which the change may have taken place. Now we must bear in mind the extremely fragmentary character of the geological record, that our systems of strata are but a few irregular rungs of the ladder reaching from the abyss of the past to the recent period; that of these fragmentary systems two-thirds are under the sea, and a portion of the remainder in inaccessible polar regions; that of the accessible areas of the earth's crust not one tenth has been explored, and probably not one hundredth carefully investigated, and that of this small remainder but a small fraction is exposed in quarries and natural sections. If, under such limitations and in so short a time, so much has been done to bridge over the gaps between different types, how vastly would our material be increased if we could summon before us the long races of beings who have left for our examination such fragmentary relics of their existence! Let me give an illustration. A few genera of mammals were known from strata of Mesozoic age. Suddenly, the exposure of a few square feet of Purbeck Oolite increased our knowledge threefold. Again, between the Purbeck with its mammals and the Eocene with its abundant mammalian fauna is the great series of the Cretaceous system, in which no trace of a mammal has been found. But would it be fair to infer that mammals died out at the end of the Oolite and did not exist during the Cretaceous? We may be sure that the hiatus occurs not in the records of the past, but in our fragmentary knowledge.

I have said that intercalation does not prove descent though it facilitates our progress towards that conclusion; but if between a fossil and a living form there be intercalated a series of intermediate forms passing gradually from the old type to the new, and those gradations correspond with the age of the successive forma-

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tions in which they are found, then we have an argument for evolution which it will not be easy to meet. The discovery of a species C intermediate between A and E would be an instance of what I have already illustrated; but if we find other species, B and D intermediate respectively between A and C and C and E, and if A B C D E occur in regularly succeeding epochs, the case is altered. Prof. Huxley, in his presidential address to the London Geological Society in 1870, gives us the following example of apparent descent. In the middle and upper eocene strata, we have the genus *Plagiolophus*, which is connected with the living horse by several intermediate forms. The gradation is seen in many parts of the skeleton, but it will simplify matters if I confine myself to two particulars. Take, first, the foreleg of the animal. In *Plagiolophus* the radius and ulna are quite distinct from each other, but are firmly united. In *Anchitherium* of the upper eocene and lower miocene, the radius and ulna are still distinct, but the ulna is more slender than in the older form. In *Hipparion*, of the middle and upper Miocene, the ulna is still more reduced in size, and is anchylosed to the radius along its entire length. Lastly, in the horse, which first occurs in the upper Miocene, the middle of the shaft of the ulna vanishes, and the two ends are welded into one piece with the radius. Thus we have a gradual transition from the *Plagiolophus* with distinct leg-bones to the horse with only one bone. Again, *Plagiolophus* has a foot with three toes. In *Anchitherium* the two side toes are more slender, but still touch the ground. In *Hipparion* they are still more attenuated, and do not touch the ground. In the horse, they are reduced to the rudimentary form of splints. Here we have a gradual transition from a three-toed animal to one with a single toe. I might ask—on what hypothesis save that of evolution can we account for the useless side toes of the Hipparion and horse? But the subject of rudimentary organs, though of great importance in our discussion, belongs more strictly to the comparative

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anatomist. I will conclude this branch of my subject by asking, if evolution does not account for such facts as the above, what other hypothesis will? There remains the alternative of Hugh Miller, supported by Prof. Agassiz, that species are separate creations produced after a divine plan. But that each species should have been destroyed, and its place supplied by a new creation; when the new form could have been elaborated by slight changes in the old one, seems to me a less natural hypothesis than the one I have advocated.

2. *The Geographical Distribution of Organic Life corresponds with the Distribution of Fossil Animals and Plants in the Epoch preceding the Recent.*

The fossils found in the later Tertiary closely resemble the living forms now inhabiting the same regions. Thus, in Australia, the living mammals (with one or two possible exceptions)are marsupial, and the Tertiary fossil mammalia are also marsupial. Outside of Australia, there is no living marsupial except the opossum, and the Tertiary marsupials outside of Australia are of the type of the opossum. South America is the home of the *Edentata* represented by the sloth, the ant-eater, and the armadillo. In the later Tertiary deposits we have corresponding fossil forms. The sloths are represented by the gigantic *Megatherium*, and other similar forms, while the armadillo has its fossil representative in the huge *Glyptodon*. In New Zealand are found curious wingless birds, and the most conspicuous fossils of the later Tertiary in those islands are also wingless birds, but of enormous size. Living monkeys are principally represented by two types—the *Platyrhine*, with the nostrils far apart, and the *Katarhine* with the nostrils close together. The former are confined to America, the latter to the Old World. So, also, all American fossil monkeys are *Platyrhine*, and all old world species *Katarhine*.

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The same law also holds good with regard to the *Mollusca* and other classes of invertebrata. The younger Tertiary deposits contain shells so closely resembling those inhabiting the same districts, that a proportion of them are even identical in their species. Indeed, the divisions of the Tertiary from the Eocene to the Pleiocene are based upon the percentage of recent species which they contain. Numerous additional illustrations might be adduced, did my space permit. The evolutionist thinks that the law thus briefly illustrated is more naturally explained by lineal descent than by separate creation.

I have said that living forms closely resemble the fossils of epochs immediately preceding the recent. But as we recede through the Tertiary periods, the resemblance grows weaker and weaker, though even in the Eocene the types of our living orders are more or less distinctly represented. But when we go back into the Mesozoic epochs, the divergence becomes much greater. Jurassic plants and animals have little resemblance to those now inhabiting the same zoölogical province. Indeed, we find in Europe a fauna and flora of decidedly Australian facies. The mammalia are mostly marsupial, and of plants, cycads and ferns predominate. The plants of North America have their fossil congeners in the Miocene of Europe. Now such facts as these are in perfect harmony with the evolution hypothesis. Since the Jurassic period great physical changes have occurred. Groups of islands have become continents, and continents have doubled and trebled their area. On the other hand, denudation has been grinding down and eating up the land, or the depression of land has caused its submergence. Since that time the foundations of Judæa, Greece and Italy have been laid in the depths of the sea. Sand and mud has been worn down from all continents, deposited in strata miles in thickness, and elevated into the Alps and Himalayas. The floor of a broad sea continuous with the Gulf of Mexico has been elevated to form the western states

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of America. A continent in the southern Pacific has sunk out of sight, and left a few coral islands as monuments of its extinction. To account for the Jurassic facies of the Australian fauna and flora, we have only to assume the separation of that continent from the rest of the world subsequent to the Jurassic period; and that, in other parts of the world, new types were elaborated, which were unable to reach Australia on account of its permanent isolation. Changes in the distribution of land and sea would in like manner shift the area of other zoölogical provinces.

I have not pretended in this paper to give a complete argument. I have simply enumerated a few facts illustrating two lines of geological evidence, both of which seem to point towards evolution. These facts will suffice to explain the *kind* of evidence with which geology supplies us, though they do not give the full strength of the argument. They compose but one branch of a wide range of territory. Geology knows nothing of living forms. Its witnesses are dead and buried, though, happily, their sepulchres are with us to this day. It is for the student of the living world to reveal the startling facts of embryology; to unfold the testimony of rudimentary organs; to expound the variations of species by domestication and by external physical conditions; to show how the variations are perpetuated or destroyed; to discuss the laws of breeding between different varieties and species; and to explain the principles of geographical distribution. My general conclusion is that evolution accounts for the facts of natural history in general, and of palæontology in particular, better than any other yet suggested. This may not amount to demonstration, but it reaches high probability, to a degree of probability which is marvellous when we consider how little study has as yet been given to the subject. At any rate, the number of eminent converts which have been made to the hypothesis should raise it above the level of unreasoning ridicule and disingenuous caricature.

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Mr. Otto Meske's Collection of Lepidoptera. By Mr. J. A. Lintner.

[Read before the Albany Institute, Oct. 20, 1874.]

I take pleasure in bearing testimony to the truth of the commendation given to the collection of Mr. Meske in the circular call for our meeting this evening, for, while there are several larger collections in our country, I am quite sure that there is not one which surpasses it "in the perfection of its specimens, beauty of preparation, and systematic arrangement."

The collection consists only of Lepidoptera (comprising the butterflies and moths), perhaps the most interesting of the seven orders in which insects are divided. While a general study of the several orders may be more agreeable to the student, and of greater practical value, yet it is only by a concentration of labor in a smaller field, that real progress can be made, and science best advanced. Our several state entomologists are expected to embrace the entire insect world in their study of injuries inflicted or benefits received, yet for the determination of the various species which come within their notice, they are frequently compelled to apply for aid to the specialist — to Hagen in the Neuroptera, to Scudder in Orthoptera, Le Conte in Coleoptera, Cresson in Hymenoptera, Osten-Sacken in Diptera, and to Edwards, Scudder and Grote in the Lepidoptera. Even a single order may prove too extensive for its proper study, and its division is required, as when Edwards, the author of *Butterflies of North America*, excluding the moths which compose much the larger portion of the order of Lepidoptera, finds himself wholly unable, in his admirable delineations, to keep pace with the

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discovery of new species of butterflies, continually pouring in upon him from the prolific field of our not half explored western territories. So, too, Scudder has unexpectedly found the illustration of the Butterflies of New England, a work so growing upon his hands, that a devotion to it for five years has not sufficed for its completion.

Mr. Meske's collection numbers, probably, about three thousand examples, nearly all of which have been authentically determined, and each carefully labeled with name, date of capture and locality. The Rhopalocera (butterflies), Ægeridæ, Sphingidæ, Zygænidæ, Bombycidæ and the Catocalas are arranged in fourteen wall cases of eighteen by twenty-four inches, like those before us this evening; the smaller Noctuidæ, Geometridæ and the Microlepidoptera are contained in a cabinet of drawers. It is mainly a New York collection; yet systematically arranged with it are very many of the European forms (perhaps constituting one-fourth of the entire collection), most of which have been received in exchange with the eminent Prussian entomologist, Dr. Speyer, probably the best lepidopterist of the age, with whom Mr. Meske has enjoyed the privilege of an intimate correspondence for years. The European forms in the collection are indicated by a green etiquette, the American ones by a white, and the comparatively few which are regarded as common to both countries by a red etiquette.

The beautiful condition of these examples before referred to, is owing, first, to the fact that very many of them have been obtained in the larva state, and carried through their transformations to their winged form, thereby ensuring perfect specimens; and second, to the extreme care given them in their preparation, with the skillful manipulation which continued practice has brought. The specimens captured in the field have not been treated after the old method of holding in one hand by the wings, while the other is applied to the thorax, pinching out their life, form, and often beauty, together. Secured at first in a filmy gauze

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net, they are expertly withdrawn therefrom in a glass bottle, in which they are killed by chloroform dropped in a cotton-packed tube leading through the cork, then turned out on the palm of the hand, and pinned with the utmost care; all this, usually, without the slightest injury to the delicate layers of scales fringing their wings. Examples such as these, are alone worthy of serving the purpose of correct description or faithful delineation.

The systematic arrangement displayed in these cases, is the result, in the aggregate, of many months of labor, and of such labor as is only given when one's heart is in his work. You all know that a collection in any branch of natural history can never be made complete, for with new explorations, new forms are continually revealed, which demand recognition and place; yet none but the naturalist can know how much is required in the effort to maintain a collection fully up to the level of advancement in any department of science. In entomology, we are at the present time, in this country, sadly afflicted with what one of our European friends, the venerable Dr. Boisduval, of Paris, has aptly characterised as a *genosomania* — an inordinate passion for the manufacture of new genera, "which threatens, unless arrested, to spread over your [our] country, until hardly more than a single species will remain for each genus." Even in the adoption of such proposed new genera as are not objectionable, serious labor is involved in the necessary relabeling. Then again, the inexorable claim of priority is continually coming before us, demanding that old, familiar, time-honored names shall be discarded in favor of new ones, dug up from some forgotten pamphlet, like Hubner's Tentamen, or other obscure resting place beneath the mold of the past century. Ever welcome as are new species to the ardent entomologist, the delight with which he receives a valuable contribution to his cabinet, is often tempered by a momentary pang, as he realizes the hours of labor required

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for the incorporation of the several species in their proper places, involving, perhaps, the shifting of the entire contents of a series of cases or drawers.

I cannot forbear from earnestly commending the zeal displayed by Mr. Meske in the prosecution of his favorite pursuit. It bears with it its own reward, in the keen enjoyment which it affords him. On one occasion, when we were passing a day together in that almost unequalled entomological collecting ground, Center Station, midway between Albany and Schenectady, on the pine barrens, where an abundant insect fauna would not be looked for, and had met with eminent success in the capture of an unusual number of rare, beautiful and new forms, culminating in my friend's netting a perfect specimen of *Sesia gracilis*, he turned to me, trembling with emotion and his face glowing with enthusiasm, exclaiming: "What is making money compared with this!" For several years he has annually devoted many days to field collecting and observations — the best service that a naturalist can render to science — at quite a sacrifice of the pecuniary gain which the same time devoted to his profession would have ensured him. In return, he is in possession of a collection, the acquisition of which has been, throughout, a labor of love; which, in the many rare and typical species contained in it, is proving of special value to science; which several of our eminent entomologists have made special journeys to Albany to examine, and from which valuable contributions, authentically named, have been made to various collections in this country and in Europe. To the material furnished by him to Dr. Speyer, we owe the paper (the first of a series), for some years in preparation, now passing through the press in Germany and [1] anxiously awaited by us here "On the Allied Forms of Lepidoptera of Europe and America."

The collection is particularly rich in several of the more interesting families to which special attention has been given. It is quite full in the Sphingidæ, that very attractive

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family, embracing the large insects popularly known as hawk moths, from their rapid flight, or humming-bird moths, from their method of taking their food while hovering over the blossoms with rapidly vibrating wings. Of the forty-one species of sphinges known to occur in the state of New York, of the seventy-six North American ones, only two are unrepresented in this collection, viz: *Darapsa versicolor* and *Ellema pineum.* It contains a fine example of the rare *Sphinx luscitiosa*, captured the present year within the city limits, not to be found, I believe, in a half-dozen collections in the world. In illustration of the intensity with which such rarities as these are coveted, I may be pardoned for quoting from a letter lately received by me from Dr. Boisduval, to whom I have before referred, a well-known entomological author, who has just completed his *Monograph of the Sphingidæ*, a work upon which he has been engaged for the last twenty years. He says: "I believe that I shall die without having seen *Sphinx versicolor* and *luscitiosa.* That I might have this happiness, I have fervently prayed to all the saints in Paradise, but all have been deaf to my cry."

The Catocalas, of which you have a fine display before you, are very fully represented in the collection. It is a noctuid genus of large and very showy moths, having their hind wings beautifully colored in various shades of yellow and of red, banded and bordered with black; in one section of the genus the hind wings are black throughout on their upper surface. North America appears to be the favored home of the genus. All of Europe catalogues but twenty-three species, while we have already seventy-three[1] American ones described. New forms from the west are of frequent occurrence, and occasionally an undescribed species is detected even in our well-explored section of the country, as was lately the case with a distinct form captured on a

[1] At the time of printing (Feb., 1875), eighty-three species are catalogued.

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tree in the capitol park of our city, and now bearing the name of *Catocala Meskei.*

In conclusion, I would commend this collection, imperfectly represented in these few cases, as one in which, as citizens of Albany, and especially as members of the Albany Institute, we may feel an honest pride. It is a valuable contribution to science, made in a modest and unobtrusive way, by an enthusiastic naturalist — one of our own number. And that enthusiasm which can find in the study of nature so keen and pure a delight, as to be superior to the sordid pursuit of gain, is deserving of our profound respect, of our reverence, whether it be displayed in the calculation of a planet's orbit, or in the study of an insect's wing.

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Thoughts on Causality; with References to Phases of Recent Science. By ALEXANDER WINCHELL, LL.D.

[A Paper read before the Albany Institute, February 2, 1875.]

When I was in London, last July, I received an invitation to participate in the approaching Belfast meeting of the British Association for the Advancement of Science. Had I known that the occasion was to be signalized by some of the most notable utterances of the century, I might have resisted the strong pressure which was urging me to the continent. As it was, I went from London to the Alps while Tyndall proceeded from the Alps to London. The latter, as president of the British Association, delivered an address, the noise of which reached me at Chamonix. It is only since my return to America, however, that I have had the opportunity to learn precisely what the great physicist uttered, and how considerable a commotion it occasioned in the newspapers of this country.

The gathering to which I refer was the scene of other notable utterances from a scientist no less distinguished and no less worthy of distinction. The two addresses, of Tyndall and Huxley, exemplify well a characteristic of recent science which, by many, has been deplored as a tendency to positivism and consequential materialism. To these two productions I might add two recent and powerful works by Haeckel of Jena, the latest of which has also fallen into my hands since my return to America. I refer to Haeckel's *Natural History of Creation*[1] and his *Anthropogeny.*[2]

[1] Natürliche Schöpfungsgeschichte, 4te Verbesserte Auflage, Berlin, 1873. 8vo, pp. 688.

[2] Anthropogenie. Entwickelungsgeschichte des Menschen. Leipzig, 1874. 8vo, pp. 732.

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In studying these latest emanations from the evolutionist school of science, I have been deeply impressed by four observations. 1. The great learning and scientific acumen of their authors. 2. Their strict adherence to the study of material phenomena, and their customary reticence upon questions which receive no direct light from physical observations. 3. The wide spread popular misapprehension of these men in respect to the subjects of their reticence, and of the bearing of their scientific opinions upon those subjects. 4. The existence of latent fallacies affecting in common, to some extent, many of their fundamental positions.

With the view of eliciting into prominence the common fundamental principles of such writers, and applying to them what I believe to be correct philosophic criteria of universal thinking, I begin by presenting the line of reasoning embodied in the address of Professor Tyndall.

This address is a panoramic survey of the history of thought and speculation on the origin and substratum of phenomena, and concludes that, so far as the inquiries of science are concerned, there has always been manifest a tendency, in leading minds, to rest, as an ultimate datum, upon the proposition that atoms and molecules exist, and their interaction is the cause of all material and mental phenomena, yet the author repeatedly recognizes the necessity of admitting the existence of some inscrutable energy farther back than the remotest cause attainable by human research.

The first efforts at reasoning traced events to superhuman agency exerted by numerous beings called gods, but the conception of whom was strictly anthropomorphic. Science was born in the desire to find fixed and orderly energies with which to replace the capricious wills of the primitive gods. While yet in its cradle, science manifested a consciousness of its mission, in attacking and destroying the contemporany religious faiths and pretensions. In seeking the causes of phenomena, from below, instead of above,

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ancient Greek speculation struck into the fundamental idea that atoms and molecules are the ultimate constituents of the cosmos. Democritus, who is pronounced a philosopher superior to Plato or Aristotle, first gave precision and form to this idea. He held to the eternity of the atoms, the materiality of the soul, and denied chance. He first advanced the idea of *vortices in the genesis of worlds.* Empedocles suggested that those combinations which were suited to their ends, *maintain themselves from their very nature*, and thus launched the thought which has taken form, in our own time, as the doctrine of the "survival of the fittest." Epicurus, while actuated by an equal desire to discover law and order in the phenomena of the universe, and thus dispel the superstitions of the existing religions, did not reject the belief in divine existence; and was himself a worshipper of the gods. Lucretius, if he admitted divine existence, maintained that the world shows no proof of intelligent design, and that all things have been caused by the shock of the atoms, while the fittest combinations have persisted. He is thought to have suggested the *nebular hypothesis* to Kant. As to Socrates, Plato and Aristotle, they imposed a yoke on the human mind which remains, to some extent, unbroken to the present day.

This auspicious inauguration of the advance of science was arrested by the quickening of the religious feeling through the introduction of Christianity, which made the mistake of adopting biblical interpretation as the criterion of all truth. The philosophy of Aristotle sanctioned and aided the *a priori* methods of the schoolmen; and, though science made positive advances in Arabia, the bond of tradition was not seriously wrenched in Europe, till the time of Copernicus and Bruno. Bacon strengthened the incipient bias toward inductive methods; and Descartes, though setting out from a first principle, unconsciously abandoned it, to present the cosmos as a pure mechanism. The full establishment of monotheism was favorable to the con-

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ception of the universe which presents it as a system of physical effects; and Gassendi signalized the possible compatibility of theology with a revived Epicureanism. The doctrine of atoms, which started with Democritus,[1] has since grown into general acceptance. But while Democritus conceived the atoms dead, Gassendi, and more recently, Clerk-Maxwell, have looked upon them as "prepared materials," thus suggesting either the postulate or the inference of an antecedent preparer. Tyndall agrees with Kant in denying the power of reason to bridge the chasm which separates the atoms from their maker.

In an imaginary discussion between Bishop Butler and a disciple of Lucretius, the close correlation between states of mind and conditions of the brain is pointed out; but it is admitted that the impinging of dead atoms upon dead atoms can never result in sensation or any other phenomenon of consciousness. This admission does not appear in the address as originally published, but there is no reason to infer that the author's position has been changed. Professor Tyndall, proceeding to the phenomena and the problem of the succession of organic forms in geological time, iterates his belief in the genealogical continuity of the series, and follows with a sketch of the origin of the doctrine of transmutation or derivation of species, and of the grounds on which the Darwinian phase of the doctrine reposes. Mr. Darwin and Professor Huxley receive high encomiums. Repetitions here would be irksome. It is asserted that variations occur under domestication and in a state of nature; that infinitesimal variations transmitted through generations become greatly accumulated and augmented; that the external conditions which are concomitant with these variations are "true causes;" that Darwin rejects teleology, even while bringing forward some of the

[1] Democritus in fact was a pupil of Leucippus, a disciple of the Eleatics. Leucippus seems to be the real originator of the atomic philosophy. Ueberweg: *Hist. Phil.*, I, p. 67.

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most striking examples of apparent design; that instincts are only inherited and accumulated experiences; and finally that Darwinism has become firmly rooted in the convictions of thinking minds.

In the recent progress of scientific research, the doctrine of the conservation of energy has become established; and this principle is held to embrace organic nature as truly as inorganic. Next, the origin of mind itself has come specially under review, and Spencer is maintained to have established for it a developmental history parallel with that established by Darwin for the physical organism. Eyes and other organs of the senses are but portions of a primitively homogeneous mass, differentiated by the influence of light and other external agents. The tactual sense is observed to possess a development correlative with the intelligence of animals; and the inference is that it determines such intelligence. Instincts and intuitions are but the accumulated experience of races, transmitted from generation to generation. Space and time are "elements of thought" or, as Kant phrases it, "forms of intuition" instead of objective realities.[1]

The author now approaches the critical point of his discussion. Having admitted that the scientist often feels himself impelled to pass beyond the field of physical phenomena, and from phenomena to induce an abstract generalization under which an entire category of phenomena may be ranged — as in the case of the force of gravitation — it is not strange that Lucretius should have reached the generalization that his atoms were endowed with life; or that Darwin should have permitted himself to be understood as abstracting creative power, exercised

[1] The phrase "elements of thought" as here used is too loose for philosophy. Space and time are not the "elements" but the concomitants, and probably the conditions of thought. "Forms of intuition" is more exact; but still, "conditions of intuition" or "conditions of the possibility of intuition and thought" would be better.

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in a limited number of initial cases, as the antecedent and cause of the series of organized beings. Darwin, our author thinks, should speak with clearness at this juncture, and assume the responsibility of carrying derivative development back, not only to one primitive stock, but to unorganized matter itself. At the same time, he admits that the doctrine of spontaneous generation is not yet proven; though he seems to regard that achievement as not very remote.

We stand now in the presence of that matter so uniformly defined as dead. We have traced life from its highest manifestations, through all its gradations to granulated, vivified protoplasm. Life is everywhere associated with matter. We know nothing of life save as associated with matter. Is there any terrestrial life which does not depend for its maintenance and its origin, upon matter? "Here the vision of the mind authoritatively supplements the vision of the eye. By an intellectual necessity," he says, "I cross the boundary of the experimental evidence, and discern in that matter which we, in our ignorance of its latent powers, and notwithstanding our professed reverence for its creator, have hitherto covered with opprobrium, the promise and potency of all terrestrial life."

Here then, he reaches the goal toward which recent theories in science seemed to impel him. This, indeed, is a sort of materialism; but we must have the candor to permit the distinguished physicist to explain the sense in which he embraces materialism. In harmony with Spencer, and in opposition to Mill, Fichte, Berkeley and Hume, Professor Tyndall entertains no question as to the existence of an external world; though we have no evidence that it *is* as it seems to be. "Our states of consciousness," he says, "are symbols of an outside entity which produces them and determines the order of their succession, but the real nature of which we can never know. In fact, the whole process of evolution is the manifestation of a power

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absolutely inscrutable to the intellect of man * * * Considered fundamentally, then, it is by the operation of an insoluble mystery that life on earth is evolved, species differentiated and mind unfolded from their prepotent elements in the immeasurable past" (p. 91).

The facts of the religious consciousness of man are repeatedly recognized. "The facts of religious feeling are to me as certain as the facts of consciousness" (p. 24, Appleton & Co's edition). "Physical science cannot cover all the demands of man's nature" (p. 42). Speaking of facts of consciousness which have prescriptive rights quite as strong as those of the understanding, he says: "There is also that deep set feeling, which, since the earliest dawn of history, and probably for ages prior to all history, incorporated itself in the religions of the world. You who have escaped from these religions into the high and dry light of the intellect, may deride them; but in so doing, you deride accidents of form merely and fail to touch the immovable basis of the religious sentiment in the nature of man. To yield this sentiment reasonable satisfaction is the problem of problems at the present hour" (p. 93). It will be noticed that he relegates religion to the realm of emotion. This force is something "capable of being guided to noble issues in the region of emotion, which is its proper and elevated sphere" (p. 93). Finally, while claiming for science a rightful and complete exemption from the restraints of all religious theories, schemes or systems, he asserts an equal right of the ethical nature to free exercise. "The advance of man's understanding in the path of knowledge, and those unquenchable claims of his moral and emotional nature which the understanding can never satisfy, are here equally set forth" (p. 97). In an address delivered two months subsequently to his Belfast manifesto, Professor Tyndall, raising the question whether there are not in nature manifestations of knowledge and skill superior to man's, replies, "My friends, the profession of

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that atheism with which I am sometimes so lightly charged, would in my case be an impossible answer to this question" (p. 102).

The ethical bearing of scientific materalism is found further set forth in an address delivered by the same speaker in 1868. After explaining the invariable relation of physics to consciousness, and alleging that, "given the state of the brain, the corresponding thought or feeling might be inferred; or given the thought or feeling, the corresponding state of the brain might be inferred," he asks, "How inferred? It would be at the bottom not a case of logical inference at all, but of empirical association * * * The passage from the physics of the brain to the corresponding facts of consciousness is unthinkable (p. 117). * * * In affirming that the growth of the body is mechanical, and that thought, as exercised by us, has its correlative in the physics of the brain, I think the position of the materialist is stated as far as that position is a tenable one. I think the materialist will be able, finally, to maintain this position against all attacks; but I do not think, in the present condition of the human mind, that he can pass beyond this position. I do not think he is entitled to say that his molecular groupings and his molecular motions *explain* everything. In reality, they explain nothing. The utmost he can affirm is the association of two classes of phenomena, of whose real bond of union he is in absolute ignorance" (p. 118).

The foregoing digest indicates that the celebrated Belfast address is an attempt to show that the most penetrating minds of all ages have felt themselves borne toward the conviction that the ultimate datum of scientific and philosophic investigation must be matter. It asserts that this is the general, or at least the forming, conviction of men of science at the present day; that all activities in the realm of life and mind, as well as in that of organization, spring out of the interactions of the atoms, and that back of this basis of phenomena, whatever we may feel impelled to

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believe, there is nothing which can be reached by real knowledge; though we are compelled to recognize a profound and mysterious reality to which our ethical feelings are coördinated. It is unfair to hurl at Professor Tyndall the charge of atheism in the philosophic sense. He distinctly repels the imputation. It is uncandid, after his careful qualifications, to charge him with materialism in that ordinary sense which excludes the notion of Deity back of matter. When he avows materialism, he means that within the region of the data of science, he discovers everything originating from antecedents under the recognized laws of matter and force. There certainly *is* something, he says, behind matter and force; but he follows Spencer in refusing to subscribe to any predicates respecting it. He is hardly a material Pantheist, for he distinctly declares that sensation and thought cannot come from dead matter; and implies that though existence emerges from matter, its ground is further back. He certainly belongs to the nescience school of theists, in which Hamilton and Mansel are older masters than Spencer; and there seems little propriety and less occasion for his assuming the burden of a confession so opprobious as materialism.

I desire to make the analysis of this address the occasion for shaping a statement of fundamental principles which ought to regulate the procedures of scientist, philosopher and theologian alike. We are all equally attempting to cleave through the dense darkness which environs us, to reach the truth of things. That we live in a universe of phenomena is generally admitted. We are therefore realities, and we all act on the assumption that there are other realities shadowed forth in the realm of appearances. No reasoning, nevertheless, can prove the existence of an external world; and the history of thought shows that it is possible, in individual cases, to stifle the universal belief that it exists. But if these phenomena represent realities,

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we are still uncertain that they represent realities *as they are.* Universal belief again affirms that they do; and yet there is room for doubt.

If we trust the indications of the shifting phenomena, the world of realities is the theatre of perpetual movement, change and transformation. We find rooted in universal belief a conviction that all these changes are severally the results of appropriate causes; and that the realities themselves are equally effects of adequate causation. It is a law of mind to look upon every phenomenon as an effect, and to couple effect with cause. It is the province of science to catalogue phenomena, to classify them, to note their relations of antecedence and sequence and formulate laws; and from observed uniformities of sequence, to lift the veil from the future and the past. It is the province of philosophy to pass beyond the phenomenon and inquire, not what is its antecedent, but what is its cause; to pass from immediate and accessible causes to remote ones, and from these to ultimate, efficient causation. Philosophy, when it has attained this limit, becomes theology. Theology is the granary in which the fruitage of science and philosophy is garnered. Religion is the activity of that department of our nature which feels its ground and sanction in the supreme Reality in which the successes of science, philosophy and theology converge.

Though searchers after truth may be ranged as scientists, philosophers and theologians, it is seldom the case that either shuts himself closely in his own field. The scientist, from phenomena induces laws; and from the postulates of his own mind deduces causes, such as gravitation, affinity, electricity. The modern philosopher combines the data furnished in reason with the conclusions yielded by science; and the theologian pursues all paths and all methods which seem to tend toward a last solution of the mystery of being and events.

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It is a misfortune, as it seems to me, for either to restrict his investigations to a single field. The practice begets indifference to certain classes of data, and ends in bigotry, misunderstandings and hostility. Our common nature covers, in each individual, the whole ground, and it seems to me narrow and pernicious for the truth-seeker to tie himself up to a single method.

Science, in its modern acceptation, does not lead to causes — still less, to primordial cause. The search for these is the legitimate object of philosophy. Science, strictly speaking, knows only phenomena, with their groupings and orders of sequence. It talks much of forces; but these are only hypotheses, verbal symbols of unknown quantities which may be one thing or another. Moreover, when the scientist steps into the realm of abstract realities, he is playing the role of philosopher.

I have said the bond between effect and cause is a universal datum of reason. I think no modern philosopher will maintain that existence or phenomenon can be the product of chance. In ruling chance, however, from the throne of the universe, it may be well to offer an explanation and a discrmination. We must recognize such a thing as chance; and we ought to understand what it is and what it is not. If I throw down a couple of dice, it is impossible to calculate what will turn up. We say the result is wholly a matter of chance. I may chance to turn up one ace, it may be two. But the contingency of the result is not the cause of it. The two aces concur by chance; but chance did not put forth the efficiency which moved each die precisely so far and no farther. The movement of the dice is as absolutely the effect of the forces exerted by my hand, by gravity and by elasticity, as if I had deliberately laid each one down with the ace up. I have not the ability so to measure and adjust the force and direction of my muscular effort as to produce a preappointed movement and lodgment of the dice; and there is, consequently,

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some range of possible movement and possible place of rest for the dice. But whatever movement transpires, and whatever may result in the position of the dice, ordinary physical forces were the cause — the proximate cause, of all. Chance, in this case, is simply a field of possibility. It is a range of values of an unknown quantity, within certain limits. It is a name for our inability to gauge precisely the forces which act — our ignorance of the precise result which they will produce.

The case is not fundamentally altered when, for the dice, we substitute the atoms of a universe. The field of possible results is inconceivably enlarged; but we must feel equally certain that, whatever adjustment the atoms assume, there has been some adequate cause or set of causes to move them to their places. We say that any particular adjustment is the result of chance; but it is absolutely certain that, whatever the adjustment, there were forces moving the atoms in such directions and with such velocities as to produce precisely that adjustment. The chance of which we speak is no more a cause in this case than in that of the dice.

Chance is essentially a negation of cause. The moment I assert that a result *is caused*, the idea of chance is necessarily excluded. Were there no cause but chance in the universe — even supposing the atoms of matter to exist — everything would rest in a state of immobility, stagnation. There would be no further effect than the birth of matter.

But suppose the existence of matter and orderly acting forces to be granted, there is much more in the collocations of the atoms of the universe than can be attributed to causes acting without discernment. We are not authorized to assert that the disposition of the atoms is the result even of blind attractions and repulsions; since, as can be shown, there are numberless adjustments in which harmony, beauty, fitness and utility have been the directive

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force; and these are qualities sustaining relations only to intelligence.

Whatever character, then, philosophy may authorize chance to assume, she cannot concede to it the character of cause. Existence cannot be the result of chance. No mode of existence can be the result of chance.

It is one of the results of science to prove that that which had been regarded as a cause is only an effect. The more we know, the longer the chain of intermediate causation seems to be. Primitive man recognizes no interval between cause and first cause. Every event in the natural world is looked upon as the direct product of supernatural causation. This is not a theoretical opinion, but a historical fact, which I have ascertained after abundant research. The relics of this habit perpetuated themselves amongst the Greeks until the dawn of Greek philosophy; and we are assured by Draper and Tyndall, and the professions of the philosophers themselves, that the aim of philosophy, in which, in ancient times, all science was merged, was, to demonstrate that events do not transpire through the direct intervention of the gods, but according to the orderly methods of physical law. With such gods as ruled in the Greek pantheon, there must have been much to stimulate philosophy and forward its aims.

Advancing from the lowest stage of barbarism, the first step in reflection discloses the law of invariable antecedence and sequence amongst physical phenomena; and the mind attaches its ineradicable notion of cause to the invariable antecedent. Here arises the notion of *physical causation*. But the invariable antecedent is now regarded the effect of first cause, acting in the guise of a supernatural power. Here is one term interposed between first cause and ultimate phenomenon.

The next step in reflection discloses the same fact in regard to the observed physical cause as had been noted at first in regard to the last phenomenon. This is also

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the effect of a physical cause; and the mind now finds two terms of intermediate causation interposed between assumed first cause and ultimate phenomenon. The opportunity presents itself, at this stage, for another observation which, in the development of science, becomes extremely significant. The recognized intermediate causes of two separate phenomena appear, in many cases, as the effects of the same cause. The number of assumed first causes is therefore much less than the number of intermediate causes.

With the further advance of reflection, it is ascertained that the assumed first cause is again the effect of remoter causation; and so its aspect changes to that of an intermediate cause, and we find three terms interposed between phenomenon and newly assumed first cause. At the same time, it is observed that, in many cases, two of the previously assumed first causes are, in common, the effect of one first cause, thus removed by three terms from phenomenon.

Thus continues, through the instrumentality of researches of the scientific kind, the process of interpolating new terms of intermediate or secondary causation; and parallel with the retreat of primary causation into the ever dimmer distance, is a diminution in the number of assumed first causes. The tendency of lines of causation, or series of effects, to converge, has been noted by every thinker. This zone of secondary causes is the peculiar field of science.

Before proceeding further, one suggestive fact should be conspicuously held up to view. The human mind all along holds fast to its notion of primary causation. Disappointed and deceived a hundred times, its faith in the reality is not one whit abated. Reluctantly and sorrowfully driven from post to post, it moves on into the unexplored darkness, full of confidence that the object of its trust will be found at last. Look, further, at the notion

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which it always frames of the character of its primary cause. True it is, that the hue of humanity is reflected over it. The first cause *does* assume human attributes. In the rude conditions of society, they are bodily as well as spiritual; but afterwards, purely spiritual. Man is conscious of the exercise of a power of causation on his own part, and he knows nothing of any other mode of essential causation. As long as all that he sees and investigates in the universe is found coördinated to the powers and methods of his own intellect, it would be an impossible philosophy to assume that primary cause, when discovered, should not exert its efficiency in a manner harmonious with the indications of all the rest of the universe. The mind of humanity, therefore, invests its primary cause with volition and intelligence. It may be said that humanity's conceptions in this and many other things are destitute of demonstrable foundation. I do not wish to meet the objection now, but would suggest that sound reasoning demands that we proceed from grounds which are strongly probable, rather than from the total negation of them, because not demonstrated. The fallacy of asserting that a given position cannot be demonstrated true, and then proceeding to reason as if it were demonstrated untrue, is a somewhat fashionable one, and has served as the basis of a great deal of bulky and ostentatious, if not very substantial philosophizing.

Another observation to be made at this point, has reference to the relative influence of polytheistic and monotheistic conceptions upon the body and the march of science. It is the characteristic of polytheism to stand ready to recognize an indefinite number of first causes; thus necessarily retarding, instead of stimulating, the search for intermediate causes. Monotheism, while recognizing but one absolutely first cause, must either favor the tendency of lines of causation to converge at a point by the continual interpolation of secondary causes or else must yield to the anthropopathic instinct of uncultured mind, in assuming

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an indefinite number of points of application of causal efficiency. This latter alternative would evidently be the resort of a monotheism not yet sufficiently exalted in scientific knowledge to be able to appreciate the full meaning of that convergence toward a unity which is disclosed in the genealogical lines of phenomena. To the first alternative it would be driven by a clearer understanding of the significance of the history of opinion; and when once fully entrenched in that position, it would contemplate with satisfaction rather than alarm, the progress of science in breaking through the unexplored barriers which separate the last found causes from the one Universal Cause.

We turn back, now, to scrutinize the field of secondary causation, in which physical science occupies itself. It is purely a phenomenal world. The data of physical science, strictly speaking, do not consist of *causes* made manifest in sensible phenomena, but of sensible phenomena themselves, certain ones of which sustain to each other the relation of invariable antecedence and sequence. The body of positive science is restricted to these. When, in obedience to a law of our minds, we connect the necessary notion of causation with a given invariable antecedence, we perform a legitimate act of philosophic thinking; but we neither know the *modus operandi* of the causation, nor whether the causation inheres in the antecedent or acts through it, nor whether such causation is primary or separated by an indefinite number of terms from primary cause. It is only an accommodated and symbolical form of expression when I say, for instance, that friction causes electrical phenomena. I only know that electrical phenomena follow friction. Friction may be the cause proximate or it may not be. That it is the first cause no one will pretend; but how many removes separate it from first cause, no one can conjecture.

Physical science may conveniently and harmlessly assume that causation inheres in the antecedent; but the habit

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of so doing must not generate a belief that the assumption represents a verity. Science may forbear to inquire — nay, in its own character it cannot inquire, whether efficient causation inheres in the material substance back of the phenomenon which stands as invariable antecedent; or whether the remotest phenomenal antecedent reached by science represents substantial first cause. Should the scientist refrain from instituting such inquiries, he should neither be reproached, on the one hand, with the charge of apathy touching questions of primary causation, nor himself commit the mistake, on the other, of assuming that inquiries in his actual field have led him to real causes. Still less should he dogmatically deny that real causation is posited outside of the phenomenal world in which his labors are conducted — beyond the last term which he has discovered with his microscope, or dissolved in his alembic, or discerned with the *Vorstellungskraft* of his imagination.

The method of science, I repeat, is chiefly inductive; that of philosophy, chiefly deductive. The science of antiquity and of the middle ages was essentially a body of conclusions derived deductively; and the inevitable and glaring absurdities of the method and its results, contrasted with the brilliant successes of the inductive method of modern times, have caused many scientists to look upon deductive processes with an unmerited degree of distrust, or even disdain. This has led them, since scientific induction cannot be carried into the field of first principles, to reject as unsafe and unworthy of consideration, the result of *à priori* reasoning. Hence has sprung up the miscalled "positive philosophy." This tendency has gone too far, and it is quite time to return to the natural method, which appreciates and weighs with impartiality the evidence afforded both by reason and the senses; and does not refuse to search for causes in the realm of immaterial things because there they would elude the verification of the crucible and the balance. Deduction, dealing with neces-

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sary truths and admitted principles, is a permissible and safe procedure, and so natural and available, that, not unfrequently, the scientist himself falls into the use of it, at the same time that he professes to observe rigorously the canons of scientific induction.

The test of a physical truth, that it must be capable of mental presentation, is legitimate; but a moment's reflection will convince any one that it is an impossible test in the whole field of abstract ideas. By what sort of process, for instance, would Professor Tyndall bring before his mind's eye a *vorstellung* of cheapness, or ambition, or despair, or even the generalization induced from a body of phenomena?

In this phenomenal world, science disposes its data according to their resemblances, concomitances and sequences. An observed invariable sequence is styled a law. In the generalized faith that a certain sequence will remain invariable, science forecasts terms which lie in the future; and, in a similar faith that it has always been invariable, science retraces the pathway of phenomena into the inaccessible past. But it is of the utmost importance to refrain from endowing the word *law* with the notion of efficiency. We say loosely that the law of chemical affinities causes the disengagement of carbonic acid when chalk and sulphuric acid are brought together; that it is a law of life that the stomach should not be dissolved by its own juices; that it is the law of the "survival of the fittest" which causes the progressive improvement either assumed or proven in the successive generations of a species in the state of nature. We are apt to think that when we have ranged a phenomenon under its appropriate order of sequence, we have pointed out its cause; whereas, laws are only uniformities of juxtaposition of phenomena. There is no efficacy in law. It is not a force, but only the method of activity of force or the order of its effects. The law which expresses the relations subsisting between the intensity of gravity and

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the masses and distances of bodies, when applied to a certain assemblage of phenomena, renders them intelligible in a certain sense; it discloses the consummate harmony subsisting amongst them, and reveals correlations which seem to be the work of intelligence; but we deceive ourselves when we imagine that the law produces a single result. The law itself is a result — an induction from the order of the phenomena which a mistaken science summons it to explain. If a progressive improvement of race is an outcome of the continuous "survival of the fittest," then this order of sequence is a law; and in accordance with it, we shall expect every race left to itself to undergo a gradual improvement; but such order of sequence is no more a cause in this case than in any other. The immediate causes of this result are the agencies which destroy the individuals not "fitted to survive" — or more accurately, the forces concerned in the continuance of the species, under the conditions (extermination of the weakest), through the surviving individuals.

Still employing the term cause in the symbolical sense customary with science, there is another set of circumstances which ought not to escape notice in scrutinizing the principles of causality. I refer to conditions of causation — sometimes called conditioning causes. There are conditions indeed to the efficiency of every cause — conditions of its operativeness in any degree; and there are others which merely modify its operation; and, not unfrequently, the two characters are united in one condition. There is danger of confounding conditions with causes. I agree to write a book, for instance, on the condition that my publishers will put it in print. It will not be written with that condition left out. But the publisher does not thereby become the author of my book. The dilute acid in the battery will attack the zinc only on condition that you connect the zinc and platinum externally by means of a conductor; but this does not render the conductor the agent which dissolves the zinc.

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I build a wall behind my grape-trellis, and I find theripening of the fruit accelerated; but it is not the wall which does the work; it is still, as before, the sun. The amount of light emitted by my lamp is determined, within certain limits, by the height of the wick; but this does not render the wick the cause of the light. The varying wick is only a varying condition of a varying result of a varying activity of a constant physical cause — chemical action between oil and oxygen. Similarly, the amount of thought which I can evolve is conditioned by all the various affections and conditions of the brain. My poetry and my philosophy are indeed correlated to brain and blood and oxygen and beef-steak; but only in the same way that my boots are correlated to calf-skin and tan-bark and black-wax. These condition the exercise of the bootmaker's skill; beef-steak conditions the exercise of mine. It is quite true that the activity in both cases has other conditions; but it is also true that none of the conditions can be elevated to the dignity of causes. The physical scientist is sometimes hoodwinked by the exact graduation of mental activity to the condition of the brain, and commits the mistake of clothing condition with the character of cause. As well assert that the wick secretes the light.

A similar departure from correct reasoning is the assignment of the "environment" as the cause of organic modifications. I shall not deny that organic modifications are generally correlated to the environment, and vary with the environment, and as a sequence of its variations. Though I have observed that organism bears no fixed, and therefore necessary, relation to environment, and even sometimes ignores it, I will assume that the correspondence is always as uniform as a certain school of derivationists picture it. What then? This is, after all, but a conditioning cause. It seems to me to imply a lack of close discrimination to assert, for instance, that increased cold causes an animal's fur to grow longer. If it grow longer

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with increase of cold, and as a sequence of it, the immediate cause is evidently the increased amount of assimilation at the growing points of the hairs. That cold is the cause of this, there is no ground for asserting. But if it were the cause, cold itself is the effect of a remoter cause — the diminution of heat-vibrations; and this is the result of a decrease of energy in the *cause of heat-vibrations* — whatever that may be. When the common potato is grown in a dry and sterile soil, it deteriorates in size and quality; and the Darwinist would assert that these changes are caused by the change in the environment; while in fact, they are only conditioned by it. The change in the soil is the condition of the assimilation of less material; it is the condition of the less energetic action of the vital forces. Whatever result ensues, it is these forces which cause it. The crane's long legs and the duck's broad bill are coördinated to their environment, and have been fashioned as they are by some cause. It is evident that the environment has been the condition with reference to which the conformation was produced. But there is no particle of proof that the environment produced them. It would be interesting to contemplate Professor Tyndall in the effort to represent to his mind's eye the process by which pond-water wove the web of a duck's foot; or that by which the consumption of clover-heads fashioned a persistent pulp in the molar of the rabbit, while forest fruits determined a limited growth in the molar of its fellow rodent, the squirrel. The whole doctrine of organic transformations, or formations, through the influence of external conditions, is infected with this fallacy of reasoning. I am not denying the coördinations alleged, but I choose to trace them to intelligible and real causes.

The scientist in pronouncing upon causal relations amongst his phenomena, is in danger of committing the logical error of *post hoc ergo propter hoc.* The fundamental conception of the doctrine of the derivation of species, under

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any of its aspects, is a case of *post hoc ergo propter hoc.* While there is not a known instance of the derivation of a species, its possibility is a mere hypothesis; and the assertion that *all* species are derivative is a stupendous assumption. What knowledge we have of the serial relations of species discloses the existence of obstacles which have never been surmounted during the period of human observations. The fossil treasures of our continent furnish us, in successive ages, a series of equine quadrupeds with a progressively diminishing development of toes, ending with the solidungulate horse. Derivation assumes that these belong to one genealogical line; while every item of positive knowledge respecting the stability of species, proclaims their transformation impossible. The gigantic basal inconsequence of Darwinism and every other form of derivation, is nevertheless greatly palliated by its harmony and parallelism with the phenomena of embryonic development; and I do not think any man better authorized to deny than to affirm dogmatically that specific derivation may yet be established as a fact.

Equally unfounded in reason or science is Mr. Spencer's arbitrary assumption that instincts are inherited and accumulated experiences "registered in the organism;" and that our intuitive ideas are "organically remembered" experiences. No glimmer of evidence exists of any such connection between instinct or intuition and ancestry; while all attainable evidence shows that, besides the absolute lack of qualitative resemblance between instinct or intuition and its alleged cause, the instincts and intuitions are the most absolutely fixed and secularly invariable elements in the system of life.

Not unfrequently the phenomena which challenge our investigation sustain relations of simple concomitance or parallelism; and when such relations appear tolerably uniform, it is natural to suspect some intercausal connection between them, while in truth nothing of the kind may

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exist; and their parallelism may result from a common relation to some higher cause. The improvement of the tactual sense in the ascending series of animal forms, proceeds *pari passu* with improving intelligence; and Mr. Spencer has assumed, accordingly, that intelligence is developed by improved tactual organs. Now, there is much better reason for affirming that improved intelligence causes improved organs; for it is obvious, from considerations already presented, that external conditions are not causes at all, but at best, only conditions; and still less could they become the cause of a result qualitatively diverse; while intelligence, as we are conscious, is gifted with the power of causation. But, in truth, neither is the cause of the other; though superior intelligence is the condition of improved coördinate faculties in the organism which is its instrument. The whole catalogue of needs and accompanying instruments for their gratification belongs to this category; as well as the parallel phenomena of mind and brain, from which Dr. Carpenter has illogically generalized his strange doctrine of "unconscious cerebration," while others have been led to conceive of thought as a "secretion of the brain."

The assignment of an uncertified antecedent for cause, is but one degree worse than the assignment of an inadequate cause. As no stream can flow higher than its source, so no cause can produce an effect greater than itself. This recognized necessity of things is disregarded in that phase of the derivative theory which contemplates organic traits augmented by inheritance. Inheritance transmits what it receives — no more. If, in the course of generations, a character become more and more developed, we discover the action of a constant force, loading more and more into the vehicle of inheritance.

We must now endeavor to approach more closely to the real objective ground of phenomena. We have assumed that an external world is a reality. We all know that its

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phenomena have been investigated by science until the chain of causation has been traced back to portions of matter which elude observation; and, by a leap, she has concluded that divisibility extends to those inconceivably smaller portions called molecules and atoms. These supposed atoms are, then, the ultimate realities of science; and all other forms and conditions of material substance result from their mutual interactions. The interactions of atoms and their resulting aggregates are admitted to be the effects of causes. The universal and individual reason would rebel against the converse hypothesis. Now those causes lying out upon the utmost verge of intellectual exploration, have been designated forces. Their modes of activity are their "laws," and produce, severally, those correlate orders of phenomenal sequence called the "laws" of phenomena. Now force, it must be perceived, is the name of an entity unknown to science. It is another symbolical term employed for convenience, the symbolism of which, as in other cases, long usage is liable to disguise. We are absolutely certain, nevertheless, that the cause called force is a reality.

Where, now, does this reality reside? I do not inquire where it acts, but where, in reference to matter, is its own subjective essence? Here opinion bifurcates. A few maintain that matter itself is the subjective ground of force, while others believe that force is external to matter. Suppose we assume matter itself to be the author of energy. The supposition involves the absurdity of confounding subject and object. Moreover, as matter must be either intelligent or unintelligent, we may suppose, at first, that it is unintelligent. If unintelligent, then the interaction of dead atoms gives rise to a universe of phenomena among which are life, volition and thought. I am willing to consider as final, the admissions of Tyndall and Dubois-Reymond on this point, both of whom explicitly assert the impossibility of eliciting intellectual fire from the collision of

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dead atoms.[1] If the force-atom is not unintelligent, it is intelligent, and we have a universe with an infinitude of atomic intelligences, acting, nevertheless, in infinite and eternal harmony amongst themselves; or else the universe as a whole is one intelligence, and objectivity in respect to it, is totally annihilated. Everything which *is*, is not a manifestation of the Supreme, but a part of it. Of these two alternatives, the first is a more startling hypothesis than that of the living monads of Leibnitz; since these were not the lodgment of ultimate cause, but subsisted under it. It may be pronounced infinitely improbable, and dismissed from consideration. The second alternative, which identifies nature with one supreme intelligence, is pantheism, the credibility of which I have no space, at present, to discuss, beyond the suggestion already laid down.[2]

The other supposition which may be made in reference to the ultimate seat of energy, views it as external to matter — that is, an entity of which matter is neither a part nor the whole. This entity may be considered as intelligent or unintelligent. If unintelligent, we have no cause for life, volition and intelligence, more promising than when we sought it from unintelligent atoms. If we suppose the ultimate ground of force to be intelligent, we have an adequate explanation of vital and mental phenomena in the world, and an immediate and all-sufficient explanation of the rational method which knits creation into a web of relationships.

This conception of supreme intelligent power, enthroned at the fountain head of phenomena, and displaying its activity in force acting upon atoms and aggregates of matter,

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[1] Tyndall: Belfast Address, pp. 68 and 87.
Dubois-Reymond: Ueber die Grenzen des Naturerkennens, pp. 20 and 29.

[2] Helmholtz considers matter resting and inactive in itself, but yet, in some strange way as animated with varying forces. The definition implies that the ultimate cause — that is, the cause of the atomic forces with which matter is endowed, is something external to matter.

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does not differ, so far as this qualification goes, from the conceptions set forth by Spencer, Huxley, Tyndall and Dubois-Reymond. Organization, like crystallization, flows from an impulse imparted to material atoms.

Now, let us look at the significance of this position. The whole range of molecular activities proceeds from the exertion of intelligent activity from without. That is, wherever and whenever those activities exist, there such energy is exerted. If molecular attraction and repulsion, which number organization amongst their results, are but force exerted from without by supreme, intelligent cause, then such cause has been active, not alone at the beginning of existence, but through the whole tale of molecular activities since the world began; and continues to act in the myriad phenomena of daily observation. The only alternative to this sweeping conclusion is that which contemplates supreme cause as exerting only an initial energy, the currents of which sweep through infinite years and infinite existence. This would imply that the molecular forces of the present are either exerted by dead matter or are not original, but simply transmitted forces. The first supposition is contrary to the premise. The second is the view commonly entertained; and it resolves the universe into a dead mechanism. There are grave difficulties which oppose it. *First*, the molecular activities of today are universally believed to be identical in nature with those which have always been manifest in matter; and hence, if the first motions were imparted by intelligent being, all are. *Secondly*, we have no knowledge or room to conjecture that molecular force has undergone any change since the morning of material existence. *Thirdly*, it is out of harmony with the facts of the moral consciousness to posit supreme causation at a point so remote from the present. *Fourthly*, the molecular forces are probably one; this is the demand of philosophy and the foreshadowed verdict of science. The atoms also, by the general admission of physicists, are

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of one kind. Now, it is unreasonable to affirm that one identical unintelligent involuntary force or impulse, acting upon one unintelligent, involuntary set of atoms, can give rise to the varied classes of material phenomena. It seems to me a far more rational resort to abandon the hypothesis of blind impulse running on in pursuance of an initial energy, and recognize, as Sir William Thompson has himself suggested, the immediate presence of first cause in all the passing activities of the material world.

This, of course, is a restoration of the very power which, according to Tyndall, antiquity invoked science to overthrow. But science herself has brought us to a situation which suggests and commends this alternative. It does not follow, however, that the universe must be again subjected to the dominion of capricious will. It is demonstrable that the universe is not so ruled; and, in view of the conclusion reached, it appears that supreme spontaneity wills to act according to fixed methods. It is surely as easy to refer the regularity of phenomena to discerning mind, as to blind mechanism.

It is a common phraseology of science to speak of heat, light and other forms of energy as "modes of motion." This form of expression is inexact, and opens the way to logical subreptions and other fallacious procedures. A mode of motion is some kind of motion, and, as such, implies *a thing moved* and *a mover*. The thing moved is an atom or molecule; the mover is the real energy to which thought is habitually directed when we speak of molecular force. Motion, instead of being an ultimate physical cause, is merely an effect. Now it is true that the real cause may produce — does produce, various modes of motion, one of which may be styled heat; another, light, and so on; and these motions, in accordance with the law of "continuity of motion" or "persistence of force," may be propagated indefinitely along the lines which characterize respectively, the several species of energy so named. Used in this

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sense, however, heat and light are no longer energies; and exact science should desist from discoursing about them as such.

Now, it seems to me that, by a defensible process of reasoning, the conclusion has been reached that the ultimate ground of physical force is voluntary intelligence. This ground may be reached from another datum. The only mode of causation of which we have any knowledge is that of which we are conscious — the exercise of free will suggested by motive, prompted by desire and directed by intelligence. By a compulsion of the reason, we feel ourselves under the necessity, when thinking of cause, to think of it as we know it. This mandate of the universal reason possesses the same authority as any other; and, if we recognize, at all, the validity of our necessary intuitions, or the authority of the common consent of humanity, we are bound to recognize the truth of this indication of the nature of causation.

Again, it is a datum of the universal consciousness that relations of order, fitness, adaptation, utility, imply intelligence. Now, the universe abounds in relations which, within the sphere of human affairs, would be pronounced such relations; and hence, by a necessary law of reason, we affirm that the cause of the universe is intelligent; and this attribute, by the necessary law of substance, we posit in real being.[1]

If then a voluntary Intelligence is the ultimate ground of all causation, and this Intelligence chooses to act according to methods so uniform that, as in the movements of a piece of mechanism, sequences can be predicated on given relations of things, it only remains to make two further

[1] It may be observed that Kant's opinion of the insufficiency of the cosmological and teleological arguments for the existence of God is determined by his neglect of the "law of substance" or the ontological intuition which carries the reason across the chasm which separates the world of phenomena from the realm of real being.

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important points. The first is, that we discern more than a single mode of activity; in other words, the forces of nature are not all mutually convertible. Some of the molecular forces seem to be so. Heat may perhaps be transformed into electricity; electricity into heat, and so on. And yet, even amongst these, we note a want of similarity. Magnetism and electricity are polar forces; but it is not pretended that heat, light and affinity are such. Though light and heat are both molecular vibrations, and hence congeneric, they can hardly be regarded as conspecific, equivalent and intertransmutable, since they are vibrations of different intensities. Electricity, magnetism, chemical and cohesive attractions, though sustaining undoubted correlations with heat and light, are not known or believed to be vibrations or modes of motion; and it seems like a stretch of evidence to pronounce them conspecific with phenomena which are such. Repulsion, moreover, is a molecular force looming distinctly above the horizon of discovery; and there are indications that its intensity is inversely as the *fifth power* of the distance, while chemical affinity varies as the *cube* of the distance. Gravity is a force varying inversely as the *square* of the distance; and it is, moreover, a force which has never, to our knowledge, resulted from the transformation of any other force; nor does it sustain quantitative or any other correlations with any other force. Here, then, in the field of inorganic nature, we find forces producing three classes of phenomena — attractions, repulsions and vibrations. Of the attractions, certain ones affect aggregates, and others, molecules; the former are again differentiated into non polar (gravitation) and polar (magnetism and electricity) while the later embrace cohesion and affinity. The vibrations, moreover, are different intensities as before stated. We have, therefore, three different genera of inorganic force, and at

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least five species.[1] Within a few years we confidently expect to find their respective lines of sequence converging at the farther limit of the phenomenal world; but here we are, at that limit, and we find five separate threads of causation emerging from the realm beyond that boundary.

In addition to this, we have the phenomena of life, back of which we discern a force which, so far as we know, is not a transformation of any other energy. True it is, that the vehicle, and instrument, and sensible expression of life is a material organism, whose building up is chiefly the work of molecular forces. True it is, that the mode of expression and manifestation of life is and must be, coördinated to this sole and material medium of expression. But that which we call life plays the part of a force which conditions the activity of the molecular forces; has never been produced by the transmutation of any of them; cannot be approached by any of the methods of physics, nor brought, like a physical force, within the grasp of numerical formulation.

The other point to be noted is, that the supreme intelligent spontaneity, as we are thus led by science and reason to think it, is revealed to us in our own mental constitution, whose laws afford us the only attainable ground of certainty; whose delegated spontaneity is a picture of the absolute will; whose intelligence takes hold on the thoughts expressed in the cosmos, and finds them comprehensible, admirable and satisfying; and, whose conscience, while it finds among men the fitting theatre for its activities, dis-

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[1] Attractions	Aggregates	Non-polar		$\frac{1}{2\text{ d pow.}}$	Gravitation
		Polar	In magnets		Magnetism
			In electrics		Electricity
	Molecules	Like molecules			Cohesion
		Unlike molecules		$\frac{1}{3\text{d pow.}}$	Affinity
Repulsions				$\frac{1}{5\text{th pow.}}$	Repulsion
Vibrations	Low intensity				Heat
	High intensity				Light

Mechanical force and motion, so far as I can see, are always effects of one or more of the above forms of force.

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covers in the supreme entity which we have disclosed, the sufficient ground for its authority and basis for its hopes.

Let me now attempt, in a concise manner, by way of recapitulation, to draw out in historical order, the steps and circumstances in the genesis and constitution of our notion of causation in the existing universe.

1. We dismiss the consideration of all secondary causation. The phrase is a misnomer. There is no real cause which can be disclosed as an effect; *first cause is only cause.* That must be an intelligent spontaneity and must act without intermediation or "instrumental causation."

2. The notion of causation implies *correlative subjectivity and objectivity* — a thing acting and a thing acted upon — a causative spontaneity and a possibility of its action otherwise than in and upon itself. In all causation, except a primordial creative act, objectivity is a reality — in primordial creation it is a potentiality. This dual necessity of subjective agent and objective possibility of effect, implies, in every case of actual causative effort, a differentiation of active and passive existence; and hence renders irrational the theory of "monism" and its corollary "pantheism" under all its aspects.

3. The *subject must be self conscious* — conscious of its own existence and power of determination. This necessity is the ground of "personality;" and it implies that the subject is a "free agent."

4. The subject *must form a concept of an effect* — a thing not yet existing or an event not yet enacted.

5. The subject must be *conscious of the relation between effect and cause* — the intuition of causality must arise in the consciousness. This intuition certainly embraces the notion of efficiency and adequacy; and, in all cases of intermediate causation, it implies also, that the effect must be congeneric with its cause. In intermediate causation we have merely a given energy transmitted — no new

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energy put forth. This must retain through an indefinite series of terms, the same quality and quantity as belonged to the initial and only logically causative act. Original causation, on the contrary, is not bound by any qualitative relation between cause and effect — though, in the finite sphere, subject to other conditions which may variously restrict the field of effects.

6. The subject must be conscious of *motive prompting to produce the effect conceived.* There must always be a *reason why* an intelligence acts one way rather than another. This necessary "reason why" is often styled the "final cause."

7. The subject *may cognize a contingency existing* — that is, a fact constant or varying which sustains some established relation to the effect contemplated. Such fact, if it exist, becomes a "condition" or "conditioning cause."

8. The subject must become *conscious of the influence of the contingency* (if it exist) *upon the conscious motive* — adding to or taking from it.

9. The subject must next be conscious of a *desire to produce the effect conceived.* This desire would be modified in a manner coördinated with the contingently modified motive.

10. The subject must next be conscious of a formed *intention to produce the effect.* "Intentionality," whose genesis arises at this point, incloses all the mental acts which precede — self-consciousness, intuition of causal relation, motivity, perception of conditionality (if existing) and desire (conditionally modified).

11. The subject must finally *will the effect*, modified by the contingent fact, if it exist.

This is the whole process of original causation as represented in individual consciousness, which, unless the harmonies of the universe be fatally misleading, is the finite eflection of the method of infinite causation.

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In the case, however, of finite causality, as in the human will, every effect external to the mind itself must be reached through instrumentalities. In most cases, the final determination does not reach immediately the external result toward which volition is ultimately directed. It reaches, nevertheless, another result which, however it may escape observation, is the effect which figures in the foregoing account. This effect is a muscular movement adapted to serve as the first term in the series of intermediate causes. After this, the whole history of causal efficiency, as above laid down, must necessarily be repeated for each separate term in the series of intermediate causes. In the mean time, complications arise. The instruments employed become effective on condition that the forces of nature prove regularly operative; and thus supreme causation may be summoned to conspire with human volition in the accomplishment of the most trivial result.

Syracuse, 1 Feb., 1875.

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Portable Boats. By Verplanck Colvin.

[Read before the Albany Institute, May 1, 1875.]

Mr. President and Gentlemen of the Albany Institute: I affords me pleasure to accede to the wishes of the members of the Institute and others who have desired me to afford them an opportunity of examining the portable canvas boat or canoe which I invented, and which was used during a portion of my Adirondack explorations of the remoter lakes.

Before entering into an explanation of the character of this portable boat, it would seem to be appropriate to give a brief account of the portable boats which have heretofore been used, so that the peculiarities of the one which I place before you this evening may be better understood, and the point wherein it differs from all boats heretofore used may be made evident. This distinguishing characteristic may be stated in brief, to be the fact that my boat has no frame carried with it; but, by a few bits of leather, etc., peculiarly contrived and placed within an exterior of water-proofed canvas, poles and boughs, cut in the forest or among the bushes on river or lake shore, are readily fastened within it as its temporary frame; a frame entirely inexpensive, and which may be thrown away when you start upon a carry or portage, so easily are they replaced. Thus, I obtain a boat weighing a little over ten pounds — all that has to be carried being the canvas exterior and its leathern attachments. My invention may therefore be called, with much propriety, *a boat without a frame!*

In reviewing history to trace the origin of portable boats, we are led far back beyond even the most ancient chroni-

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cles, and find some forms of them existing even in prehistoric times. Indeed when we come to examine the causes which lead men to desire a light, portable boat, we will find that all the different available forms known to the world have been originated either among savages with the first dawning of civilization or — for here extremes meet — when civilization pushes out into the wilderness or among savages, where the narrow lanes of water and frequent landings and portages will not admit of larger craft.

Perhaps the first of portable boats was that which carried Moses in the bulrushes — but that cannot be determined.

The earliest form of water conveyance was probably the raft. A floating log may have saved some tired swimmer — a witless savage flying from murderous enemies — with yet wit enough to grasp the log, as a drowning man is popularly supposed to grasp the straw. The log which floats him he soon learns to guide. Hereafter he will have a raft. Another step — his leathern water bucket, left at the water side, he sees wafted off upon the tide, high and dry, which, if full of water, he knows would sink. He sees and thinks, and shortly turns shipbuilder. Whether he labors in vain to build a raw hide boat, collapsed as soon as his foot is placed in it, who can tell: this much we know from archæology, the earliest remains of boats found mingled with the remains of prehistoric races are "*dug-outs*," hollowed logs, monstrous shaped things like horse-troughs, which served them to navigate the prehistoric waters.

The dug-out, however, as every one is probably aware, cannot be considered a portable boat. Even the light cypress dug-outs of Florida, beautiful in shape and finish, are hard to propel through the bayous against wind and tide, let alone their carrying. The boat of skins might, indeed, have been the earliest, the perishable character of its substance preventing its preservation in the cranogues with the other remains of more solid character.

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The earliest form of portable boat of which history gives us any account is that which we might call the bull-boat, being made of neat's hide upon a light wicker-work but permanent frame. Herodotus says (Book 1, p. 193): "The boats which come down the river"—meaning the Euphrates—"to Babylon are circular and made of skins. The frames which are of willow are cut in the country of the Armenians, above Assyria, and on these, which serve for hulls, a covering of skins is stretched outside, and thus the boats are made without stem or stern, quite round like a shield." This form, which seems to have existed even in pre-historic times, about the same in form in Egypt as in Britain, was known to the Romans as *curuca*, *carrocium* or *caribus*, and to the Celts as *corwig* or *curach*. Cæsar describes those of the ancient Britons as having, in addition to the wicker-work, keels and gunwales of wood, permanent and substantial, though rather light boats for sea voyages, we would be apt to think. Yet there are records of those early days—when men were men indeed—of the North sea daringly navigated, and the Irish channel crossed (a tedious voyage of seven days) in one of those leathern tubs! In England this form of portable boat has long since gone out of use, a few specimens gathered from the Highlands of Scotland remaining as trophies in archæological museums; though latterly, some of modern construction have been used in so called *coracle races* for fashionable amusement. It was, however, only in recent times that the coracle, as it is modernly called, disappeared generally in Scotland, where they had been long retained by the highland lumbermen for what our American lumbermen would call river driving—the loose timber being finally made up into rafts, and the bull-boat no longer needed. In Ireland the coracle is, however, still in use and has been described as follows: "It is in shape oval, near three feet broad, and four long; a small keel runs from the head to the stern; a few ribs

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are placed across the keel, and a ring of pliable wood around the lip of the machine. The whole is covered with the rough hide of an ox or a horse; the seat is in the middle; it carries but one person, or, if a second goes into it, he stands behind the rower leaning on his shoulders. In floating timber (lumbering) a rope is fixed to the float, and the rower holds it in one hand, and with the other manages the paddle. He keeps the float in deep water, and brings it to shore when he will. In returning home, he carries the machine on his shoulders, or on a horse." The frame is permanent.

England, to whom the "hearts of oak" of old, and iron ships to day, afford subject of just pride, would, perhaps, hardly feel elated in the contemplation of what a majestic fleet of bull-boats obeyed the orders of Queen Boadicea — the infant navy of Great Britain — the portable boat, suited to the wild and savage character of England at that early period.

Among our western Indians of the great plains, a sort of coracle was in use, made from the hide of the buffalo, strongly secured upon a firm frame. A boat, essentially the same as the coracle, is still in use in Thibet, and is described by Abbé Huc, in his travels in Tartary, etc., where he found it in use upon the river Bo-Thou. The interior was formed of ox-hides, strongly sewn together, and formed upon a frame-work of bamboo. It could be carried overland by its owner, but the frame was permanent.

Nearly allied to the bullboat or coracle is the kayak, kajak or kia of the Esquimaux — differently called in different dialects — an ocean vessel of the Arctic zone; how ancient we can hardly tell. Like the coracle, this boat is made so light that it is said "a man can carry his kia on his shoulders from the house to the water." The frame of the kia is permanent, and consists of whalebone joined with fragments of the drift-wood which the

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ocean tosses upon those Arctic shores. Over the frame, the covering of seal-skin is tightly and securely fastened, the seal-skin being neatly and elegantly sewed together, the smooth thin covering being almost transparent, and showing indistinctly the limbs of its owner, who, sitting in the centre of his narrow, tube-like craft, with the seal-skin collar of the man-hole gathered and bound around his waist, his coat collar and sleeves also made waterproof, ventures out upon the stormy sea to secure his livelihood; daring with his harpoon and lance to battle with the walrus and narwal, and to assert, in those wild boreal waters, the pre-eminence of man and mind.

The kia or kayak has an average length of twenty-five feet, with a width of perhaps eighteen or twenty inches. It has no keel, and being so narrow requires skill in its management among the billows. The Esquimaux, however, with his double-paddle, not only navigates the icy seas with safety, with wonderful skill balancing and propelling himself with his paddle, but also manages to perform some feats which may be termed national and peculiar to those northern tribes. He regards it as a mere pastime to leap one kayak over another at sea, but with more caution approaches his *chef-d'œuvre.* Throwing himself and canoe sideways violently on the water, with a strong, quick stroke of the paddle, he disappears under the surface to leap in sight again upon the other side — sometimes proceeding thus rapidly fifteen or twenty times — the kayak serving as the axis of motion. Thus we perceive that even the dwellers amid icebergs have their pleasures and pastimes — wild and savage as the rude regions of their habitation, yet dependent upon the same emotions of the heart as those of more favored people.

It is stated of this boat that "The paddler is so tightly tied to the kia, that he is unable to change his position without assistance, or even to lift a heavy weight, such as a seal. In such a case he asks assistance from a companion.

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The two kias are placed near each other, and paddles are laid from one to the other, so that for the time they are formed into a double canoe, which cannot be upset." * * * "An inflated seal's bladder is always attached to the canoe. When the kia is not in use, it is taken out of the water, and rested in an inverse position upon the huts."

The Esquimaux have also another kind of boat of skins, which may be carried from place to place, but is so large as to hardly come within the limits of the portable. This is the woman's boat, called the oomiak, a large, clumsy, scow-like, straight sided ship, of raw hide, which conveys their baggage. A well made oomiak will carry a heavy burden. One is mentioned "measuring twenty-five feet in length, by eight in width, and three in depth," in which more than twenty Esquimaux were conveyed. This boat is occasionally fitted with a sail, and its general character renders it far from portable. Like the kayak, its frame is permanent, for indeed on those Arctic shores the material for boat-frames is not easily procured.

The canoes of the South sea islanders, being generally intended for ocean voyages, and constructed of wood, lie beyond the bounds of our subject. Their wonderful double canoes, in which they venture far from land on the broad Pacific, are not portable, and even the light, small forms of canoes which they have, though they may be lifted and carried, are hardly more of a portable boat than the surf boats which the Sandwich islanders use in the exciting pastime of their tropic coast.

Nor are the bamboo rafts of the Chinese, boats in any true sense of the word. Like the catamaran of the East Indian coast, they are simply floats — excellent in their way — the catamaran being more safe than the ship's boat in the furious surf of Madras. This form of light raft is also used on the west coast of South America.

Among the Indians of South America we again meet

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with good examples of portable boats in their periaguas of the lighter construction; but one of the heavier kind which Columbus, on his fourth voyage to the New World, saw at the Guanaja islands, was hardly portable, though made from a single tree; being eight feet wide and propelled by twenty-five rowers. It had awnings, etc., and was supposed to have come from Yucatan.

Among the Patagonians we find elegant examples of light boat construction, most singular and interesting forms being made by the inhabitants of Terra del Fuego; but it is only among our own North American Indian tribes that we find what, to my mind, is the most beautiful and elegant of forms — the birch-bark canoe.

The Indian canoe probably owed its origin to the peculiar character of our northern regions, where myriads of small lakes, each almost if not entirely joining with the other, and streams and rivers, now foaming in rapids and now stretching in long reaches of still water, interposed a tangled net-work of impediments to the traveler without boat, and at the same time remained equally difficult to those whose boats could not be readily carried over the numerous portages necessary.

The origin of the birchen boat cannot be traced. Wherever the canoe birch tree is found, the natives made from it their boats. How many millions worth of fur and peltry have those light canoes carried down from the heart of the wilderness to the trading posts of the whites, since the day when those frail boats clustered around the ship of Henry Hudson! How many white pioneers have, in these birch canoes, penetrated to the far west to lay the foundations of our modern empire!

It is superfluous to describe the Indian canoe, and it is hardly necessary to remark that its frame, like all those before mentioned, is permanent, and that the removal of the frame of an old canoe would amount to the destruction of the craft.

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In our wilderness, the first substitute for the birch canoe was the light boat known as the bateau, well-suited for the transportation of military stores, and extensively used during the French and Indian and revolutionary wars. Thus we find the savagery of civilization making the first improvements by substitution of the bateau for the boat of the savage, to aid in the successful prosecution of more savage war.

In the Adirondack region, at the close of the revolutionary war, there were many white hunters and trappers who used the birch canoe in their voyages by lake or river. Few of these white trappers were able to build their own canoes, and as the Indians slowly disappeared from our northern wilderness, the white hunters were gradually thrown more and more upon their own resources for water craft. They commenced by building provisional canoes from huge sheets of bark of the spruce tree. From a personal experience with this variety of craft, I cannot recommend it. The fresh spruce gum covers the inside in a disagreeably sticky way — your only satisfaction being that it is "pitched both without and within with pitch," in a manner which might have satisfied Noah. It is also frail and perhaps unsafe, its frame, of course, being as permanent as the boat itself.

The canoe, however, was the desideratum in a country like the Adirondack, where the traveler by water can scarcely proceed a dozen or half a dozen miles without carrying his boat and baggage over several miles of portages, and after many trials and years of patient labor, the Adirondack guides have produced, in their light boat-canoes, one of the most graceful, elegant and portable of boats. Nevertheless the ordinary Adirondack boat, ten or twelve feet in length, weighs from sixty to ninety pounds, and in addition to the other baggage forms a heavy weight to be carried on the shoulders of one man

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through the forest, over carries or portages sometimes two or three miles in length.

During the last ten years, I have had frequent occasions to use these boats in all their different forms. I have always entertained for them the greatest admiration, but have never liked to back one over a three-mile carry. Often my pity has been aroused at the sight of my guide, struggling through the forest and over the hills under his bulky burden, and often have I been annoyed in the course of wilderness exploration by the sudden discovery of a lake where none was supposed to exist, by finding myself without a boat in which to explore it; and oh! the slow and solemn times that I have experienced while endeavoring to pole along a raft!

After much reflection, I came to the conclusion that the first essential of a boat was its outside — the very cuticle, if firm enough, being sufficient. Further study and tests led me to select canvas as the best substance for the exterior, and that was many years before I placed this boat upon the Adirondack waters.

Now, portable boats of rubber were in use long ago, and canvas has also been employed in boat construction. Colonel, now General John C. Fremont, carried with him a rubber boat, and with it explored a portion of the Great Salt lake, perhaps the first navigation of that water by a white man. His boat, however, had a frame which it was necessary to carry with it, and withal leaked badly; it was used, I think, but once afterwards, when it was wrecked in navigating a rapid river. Dr. Kane, in his Arctic explorations, carried with him, also, a portable rubber boat, of the fate of which we only know that it was cut to pieces by a thievish Esquimau, who wanted the wooden frame within. This boat required its frame to be carried with it. In the army, canvas pontoons have been used, but these also require very heavy and substantial frames to be carried along, and old soldiers may remember how many men were

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detailed to bail them out. Captain Hall carried with him on his last ill-fated expedition in the Polaris, a canvas boat; but this, like all the others, had its heavy, cumbersome and bulky frame. Paper boats, of fine construction, have been made in the neighboring city of Troy, and have proved good for racing purposes. It is almost unnecessary to state that they are permanent in character, and rigid and constant in frame. The Rob-Roy canoe, in which Mr. MacGregor explored so many of the waters of Europe, had a permanent frame. (The remarkable life-dress of Captain Boynton, cannot be considered a true boat, nor would it serve the purpose of one for ordinary use. Life preservers, cork jackets and the valuable canvas life rafts, of tubes, now used on ships, cannot be termed boats, being properly called floats.) All these differ from my boat, for which it is not necessary to carry any frame in any region this side of Arctic and Ant-arctic circles. Even on our great western plains, I have not seen a stream, whether it be the Platte, the Cache La-Poudre, or the Smoky Hill or Republican forks of the Kaw, which had not along its banks sufficient brush or timber from which to construct all the frame that my boat requires. There is hardly an *arroyo* of the habitable west whose shores have not some margining of brush, sufficient for my boat frame.

The peculiarities, then, of the boat which I place before you to-night, are the means by which I so readily attach a frame within the canvas boat exterior.

The canoe exhibited is twelve feet long and four feet wide; the portion of the boat which is carried weighs ten pounds eight ounces (leaving out the light leathern pieces which receive the corners of keelson and gunwales); and when compactly folded it occupies the space of less than 864 cubic inches, or less than half a cubic foot. It has carried, in a heavy storm, far from land, a burden of seven hundred pounds, and will probably, in smooth water, convey a much greater burden. The prows, as seen, are guarded

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with brass cut-waters, riveted on. One great peculiarity of the boat is that no iron or steel is placed in it, and the surveyor using it in the reconnaissance of a lake will have no trouble with local attraction of the needle. The name which I have given it is that of the Adirondack lake on which it was first practically put to the test.

Ampersand Pond! Glorious lake, silent and remote in the depths of the Adirondack forest. Walled in on the south by the dark, massive summits of Mt. Seward — loneliest of peaks — and on the north by the ridge of Ampersand or Moose mountain, while other peaks clustering, seem eager to shelter it from all view save that of the celestial orb of day that gilds the valley with its glory, and fills its wavelets with sparkling brilliancy. Well do I remember that day, when the guides, having tied in the light boughs, that we had cut a short while before, carried it down and placed it lightly on the water. Their merriment at the idea that "such a pork bag," as they called it, could float or carry anything, was scarcely concealed. But when the huge hound, after gazing at it with gravity, walked out upon the log beside which it floated, and soberly climbed in, they could not restrain their laughter, but yet exclaimed, "Well, it looks just like a boat." And then I persuaded first one and then the other, to enter — the boat floating meanwhile like a feather, and with the dip of the paddles we were off, over the flashing waters, seeing each wavelet, as it rippled against the sides, flash in the morning sun.

How we traversed the lake over its deepest waters, with nothing between us and the water but the thin canvas; how, with sextant and compass used from the boat we had so lately occupied as bed or tent by turns, the figure of the lake was mapped; how in it we chased a deer, almost catching him as he leaped ashore, or how, shortly afterward, in pushing down into the outlet of the lake, we suddenly came upon a monstrous panther stretched at full length upon a

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log, watching for deer, permitting us to come within a rod or two ere he retreated, leaving us surprised and forgetful of our revolvers, I cannot here expatiate upon.

Nor can I tell you of our more dangerous experience on the Lower Saranac lake, in cold and storm. A stormy, rainy day found us on the beach of Cold brook, an affluent of the Saranac river. Here we designed reconstructing our boat frame, the old one having been thrown away at the last camp. In a short space the guides had cut a young tamarack for the keelson, a couple of stout poles served as gunwales, while two dozen boughs, cut among the bushes at the brook side, formed the ribs. A couple of paddles were hewn from a white cedar near by. While one guide cooked dinner, another, with my aid, tied in the ribs of boughs, slipped in the keelson, and bound on the gunwales and cross pieces, and in an hour and a half from the time we struck the brook we were gliding down stream, three men, two hundred pounds of baggage and instruments, and the huge hound sedately standing toward the prow.

The navigation of the stream was easy. Out in the broader river the violent cold wind made our craft veer a little, and when, an hour later, we struck out into the broad Saranac lake, the white caps in the distance proclaimed a heavy sea. It was a wintry day. Snow lay upon the mountain tops, and when another hour passed, wild, black, foam-crested billows swept around us, and our craft rode safely, now high on the crest, now low in the trough, we felt, though chilled and shivering, when we floated up at Martin's in safety, that it was a triumph.

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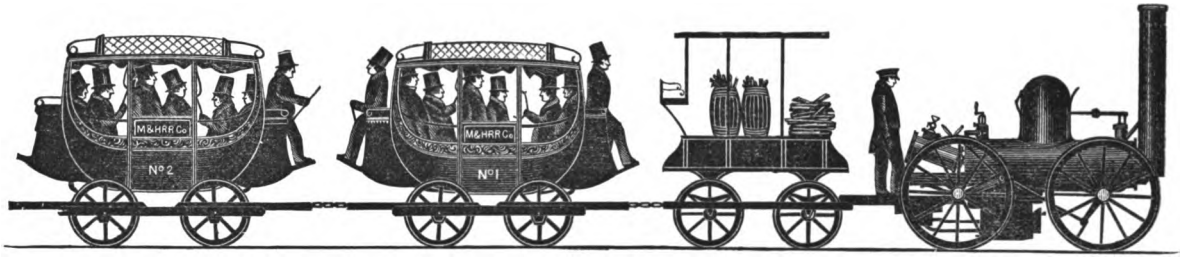
MOHAWK AND HUDSON RIVER RAIL ROAD.



STYLE OF FIRST PASSENGER TRAINS BY STEAM POWER BETWEEN ALBANY AND SCHENECTADY.

1831.

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The Mohawk and Hudson River Railroad. By JOEL MUNSELL.

[Read before the Albany Institute, April 20, 1875.]

The tradition of an extraordinary excursion upon the rail road between Albany and Schenectady, at an early day in the history of that road, being a subject of much discussion at this time, and not generally well understood, I have endeavored to investigate thoroughly the facts concerning the event. Although it occurred within the memory of persons who may now be present, and who witnessed or may have been cognizant of it, there is still no little doubt and controversy about it, especially as to when it took place, and who occupied places on the train. The lithographed representations of it that are frequently met with serve to perpetuate the memory of the mysterious trip, and to excite curiosity respecting it.

Observing that Knickerbocker began the history of New York with an account of the creation, and that a more recent chronicler has commenced the annals of a neighboring inland county with the discovery of America by Columbus, I am disposed to make a starting point at that era in the history of artificial locomotion, when the transportation of coals for fuel in England had become so great a strain upon physical exertion, as to stimulate invention in aid of the efforts of man and beast to overcome obstacles in the pursuit of that enterprise.

Accordingly we find that in 1676, two centuries ago, a rude contrivance was brought into use, by which coals were moved in cars running upon wooden rails; and it

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was not until a century later, that iron rails were introduced. Indeed, although a rail road was constructed in France, in 1783, the principal use made of rail roads until near the end of the first quarter of the present century, was the transportation of coals in England. They were mostly short roads or tram ways among the collieries, and the trains were taken up and down inclined planes, by stationary engines. The era of successful operations for the transportation of passengers upon rail roads by locomotives propelled by steam power, dawned but half a century ago; and the plateau familiarly known to us as the pine plain, between Albany and Schenectady, was the theatre of a genuine passenger rail road almost as early as any in the world.

Overlooking the theories and experiments of Oliver Evans in the last century, we find that in 1812, a pamphlet was published for the purpose of explaining the superior advantage of rail ways and steam carriages over canal navigation, particularly on the peculiarly favorable route from Lake Erie to Hudson's river, which had been the ancient trail of the Indians, and which will undoubtedly ever remain the natural and most feasible land passage between the two waters. Mr. Stevens of New Jersey endeavored to persuade all who were engaged in public improvements, that rail roads were cheaper and more effective, as well as far more rapid in transit, than was possible to be attained by water. Mr. Featherstonhaugh of Schenectady also put in a plea for rail roads.

But the great enterprise of constructing the canals, in which the energies of the state were at that time involved, overshadowed all other schemes. Yet no sooner were they completed, and in successful operation, than the project of a system of rail roads parallel to the Erie canal began at once to be persistently agitated. A writer in the *Argus* of 1825, urged upon capitalists the absolute necessity of their entering upon the construction of a rail road to Schenectady

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to prevent the city from going to decay through the rivalry of Troy! And as if that danger was really felt to be imminent, we find that in November of that year it was announced agreeably to statute, that an application would be made to the next legislature for an act to incorporate a company to construct a rail road from Schenectady to the Hudson river at Albany or Troy, as should be deemed most advisable.

The project was brought before the legislature early in the session of 1826, and a bill to incorporate the Mohawk and Hudson rail road company introduced. On the 10th of March the bill was discussed in the assembly. It is amusing to note the tenor of the arguments advanced by some of the legislators on that occasion.

Mr. Lush, the Albany member, moved to strike out that part of the bill which gave the company permission to locate the termination of their road at any point of the river lying within the distance of three miles above or below the city of Albany. He hoped the house would not consent to a measure which might have a tendency to divert trade from this city, and carry it to a place below, where speculators might purchase land and build up a town which might rival and seriously affect the interests of Albany. The Albany and Schenectady turnpike company had spent much money, he said, in improving a road between the two cities, and had never realized more than two per cent on their investment.

Mr. Hoffman had yet to learn that the interests of Albany were to be looked to as paramount to those of the state. If the company found it advantageous to terminate the road here, they would no doubt do it; but if it should be inconvenient from the nature of the ground to do so, they should certainly have elbow room enough to terminate it at any other place.

Mr. Sill did not know as it was important that the proposed road should come out just where the old Dutch

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church had stood. The ancient burgers of Albany thought that nothing could be an improvement which went beyond its limits. The City of Hudson owed its origin to such narrow views. Many years ago a number of persons from the eastern states wished to purchase the ground at the southern extremity of this city, called the pasture; but the Albany dons would not sell it, because they did not think it right that population and business should go beyond the old bounds. The consequence was that the immigrants went and settled at the place now called Hudson. Some years ago the Albanians wanted a bridge, but the project was defeated by their quarrelling among themselves, whether it should be opposite one wharf or the other. Something of that sort appears to be going on now.

The speaker of the house, Clarkson Crolius, thought that passengers and light freight might be easily conveyed upon the road, but he conceived that heavy articles would be transported on the canals, and the revenue of the state derived from that source would not be diminished. It had been said, that rail roads in England had almost superseded the use of canals. The reason might be that the boats were small and the supply of water scant; the boats in England could, by the aid of machinery, be placed with all their freight upon the railway carriages, but he doubted if our heavy boats would ever be conveyed in that manner. He would like to see the experiment of a rail road tried in this country, and hoped the bill would pass, and that the applicants would be permitted to make the experiment at their own expense.

G. W. Featherstonhaugh, in a letter to the mayor, said that transportation of property from Albany to Schenectady was seldom effected in less than two, and sometimes three days. By rail road the communication between the same points would be safely made, in winter and summer, in three hours, at no greater cost than by canal, paying for sixteen instead of twenty-eight miles. He regarded this

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experiment as a test whether this economical mode of transportation would succeed in this country. At this time the most available and rapid inland travel was by stages, and more capital was invested in them than in any other enterprise carried on in this city.

The bill passed the assembly on the 27th of March, 1826, incorporating the company with a capital of $300,000, with liberty to increase it to $500,000, and a duration of fifty years, limiting the time for construction to six years. Stephen Van Rensselaer, known as the old patroon, and G. W. Featherstonhaugh were the only persons named as directors in the charter.

This seems, therefore, to have been the first charter of what became a successful passenger rail road in this country. No rail road had been constructed on the American continent, for the conveyance of passengers by steam power, previous to this date. The South Carolina road was chartered nearly two years later, and its construction begun in 1828. The Delaware and Hudson, and Baltimore and Ohio roads were also begun in 1828. The first two practical locomotives built in this country, were constructed at the West Point Foundery, in the city of New York, for the South Carolina road, and the trial trip was made in November, 1830. The third was the De Witt Clinton, built at the same foundery, for the Mohawk and Hudson road, and put in operation nearly a year later.

On the 26th of June, 1826, books were opened for subscriptions to the stock of the Mohawk and Hudson rail road, and we have the authority of two daily journals, the *Albany Daily Advertiser* and the *Albany Argus*, that the stock was eagerly taken by capitalists. But the company seems to have moved with the safest haste from this time forward, for more than four years elapsed before the construction of the road was begun.

It may be remarked here that the Quincy (Mass.) road, which is often mentioned as the first rail road in this country,

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was built for the purpose of transporting granite from the quarry to tide water, a distance of three miles, was not a passenger road, and was operated by gravitation and horse power, in 1827; and that the first substantial and effective locomotive put upon an American rail road was the Stourbridge Lion, built in England, and run out of Honesdale on the Delaware and Hudson road in 1829; but it was abandoned and never brought into practical use, horse power being adopted instead — for the reason that the structure of the road would not admit of the use of a locomotive of so great weight.

On the 29th of July, 1830, the ceremony of breaking ground for the Mohawk and Hudson road took place near Schenectady, "*with a silver spade*," by Stephen Van Rensselaer, then known as the old patroon in contradistinction to his son Stephen, the young patroon. In September it was announced that the stock of the road had risen to ten per cent above par, and the editor of the *Daily Advertiser*, always enthusiastic about such enterprises, predicted that trains would make trips between the two cities in three quarters of an hour, and reach Utica from Albany in four hours. The latter was a somewhat startling prediction, when we consider that the utmost exertion of the stages barely overcame the distance in twelve hours.

The officers of the company had decided to use steam power, and had ordered two locomotives, one from Stephenson of England, similar to those that were in use upon the Liverpool and Manchester road, and another from the West Point Foundery in the City of New York. On the 23d of July, 1831, neither of them had arrived.

The construction of the road was described by the editor of the *Argus*, Mr. Croswell, as supported upon square beds of rubble, in which a heavy stone block was imbedded, each pier containing eleven cubic feet of block and rubble stone, the piers as being placed three feet from centre to centre, and forming almost a continuous stone

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wall. It was claimed that the construction of the road was superior to any other in the world! and that the stone filling alone cost as much per mile as the whole of the Baltimore road; and that it had an important advantage over other roads in being perfectly straight, and consequently less liable to lateral pressure. A force of about 2,000 persons had been employed in its construction. The highest ground on the line was 335 feet above the level of the Hudson river.

The locomotive De Witt Clinton arrived by tow boat on the 25th July, 1831, and was put upon the road on the 27th, twelve months from the time when the ceremony of breaking ground was performed. On the 30th of July an experiment was made with the locomotive, but owing to some defect or inexperience in burning Lackawanna coal, the speed did not exceed seven miles an hour, and it was determined to substitute coke. Meantime the road, which was completed and in use from the junction of the Western turnpike and Lydius street, about twelve and a half miles to the brow of the hill at Schenectady, was operated by horse power. Besides platform cars used in the construction of the road, a number of stage coach bodies were placed upon trucks for temporary use, affording seats for fifteen or eighteen passengers each. On the 3d of August the De Witt Clinton made the trip in one hour and forty-five minutes, and on the 10th they ran two trains each way with coke, making a part of the trip at the rate of thirty miles an hour!

Aug. 13, a large company assembled to take a trip on the rail road. The locomotive De Witt Clinton had been found defective in the capacity of the boiler, and portions thereof were returned to the foundery for improvement. The train was moved by horse power, consisting of five cars, each containing from fifteen to eighteen persons, most of whom were notabilities and interested persons, ac-

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companied by Mr. Cambreling, the president of the company. These vehicles were usually drawn by two horses, driven tandem.

On the 8th of September, the De Witt Clinton was again upon the rail, but there was now difficulty with the feed pipe, and the train did not return. On the following day the train came over the road in forty-five minutes, but there was still trouble with the feed pipe. They had gone back to first principles and adopted wood for fuel.

On the 17th of September, the English locomotive was on the road. Its power and weight being double that of the American engine (12,742 lbs.), great expectations were entertained of its efficiency. A delegation from New York arrived, for the purpose of examining the road preparatory to a decision upon the application of the Harlem company, to lay their rails on the Fourth avenue of that city.

Active measures were also in progress to begin the Schenectady and Saratoga road, and a survey was being made by the Troy and Vermont company. The trustees of the Schenectady turnpike also had got an inkling that something new had turned up, which they had been slow to perceive. A survey was begun by Mr. Cushman with a view to laying down rails, it being claimed that they were invested with rail road privileges. The project was quashed, I am told, by a division of $100,000 of Mohawk and Hudson stock, at par, among the stockholders of the turnpike.

Although the locomotive De Witt Clinton had been placed on the road in July, and the city officials and other dignitaries had passed over it both by horse and steam power early in August, it was so late as the 22d of September, when the locomotive was advertised to take passenger trains. The road was still uncompleted, and used only from the junction, as it was called, two miles from the foot of State street, from whence passengers

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were taken to the train by stage coaches. The other terminus of the road was still at the bluff overlooking Schenectady, where passengers were again transferred to stages. The distance traversed was less than thirteen miles. From this small beginning, however, it has been claimed, ignoring the South Carolina and the Baltimore and Ohio roads, that this was the first passenger rail road on the American continent operated by a locomotive, entitled to consideration as a success. It was undisputably the first in the state of New York.

The precise time when the directors of the road felt prepared to crown the complete success of their labors by a grand excursion, to which were invited the state and city officials, and a number of eminent citizens of New York, was the 24th of September, 1831. There are so many different accounts of this affair, and it is involved in so much doubt and uncertainty that it has been suggested whether, after all, it was not an imaginary event. But we have the truthful portraiture of a portion of the train, the handiwork of Mr. Wm. H. Brown, a remarkable artist, who wrought with a pair of scissors, after the style of the Silhouettes, graphic representations of persons, and of things occurring at that time. This train was so vividly represented by Mr. Brown, that many persons have been led to imagine that they can identify the passengers from his *cutting*, as we may term it. A lithographic copy of this picture has been made, and extensively circulated, in which certain figures of persons in the cars are designated by numbers and names.

More inquiry has been made than the importance of the subject demands to verify the names of the persons claimed to have been present; but as five new cars, or coaches, had been put on the road for this occasion, there were not less than eighty passengers in all, and a crowd that could not obtain seats; therefore the efforts that have been made by several ardent antiquaries through personal inquiry and by

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correspondence, to make up an accurate and complete list of the passengers on this train has failed, as might be expected.

In this picture but two of the coaches are brought into view, which are represented as carrying eight passengers each, while their real capacity was fifteen at least. These vehicles were built by Mr. James Goold at his manufactory in Union street, and were mere stage coach bodies, placed upon trucks and supported upon thoroughbraces in the manner of stages. They were ordered by Asa Whitney, who had charge of the construction and equipment of the road. The tender was a platform upon a truck, on which fuel was placed, the supply of water for half the route being taken in at the start, with provision of a tank at the half way house for water to carry the train through. The trucks were built in Schenectady.

It is doubtful whether the names collected after so much research, traditional and authentic, really belong to a single trip, or should not rather be distributed among two or three of the early excursions. The chief engineer, John B. Jervis, and the resident engineer, John T. Clark, who acted as conductor before the appointment of such an official; David Mathews, the engineer and builder of the locomotive, and John Hampson, the fireman, were there. Then follow the names of such invited guests as have survived the lapse of time and memory.

Churchill C. Cambreling, president of the road.
Enos T. Throop, governor of the state.
Charles E. Dudley, senator in congress.
Azariah C. Flagg, state comptroller.
Edward P. Livingston, lieutenant governor.
Joseph Yates of Schenectady, late governor.
Stephen Van Rensselaer, patroon.
Francis Bloodgood, mayor of Albany.
John I. De Graff, mayor of Schenectady.
Reuben H. Walworth, chancellor.
Joseph Alexander, president of the Commercial Bank.

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Samuel Swartwout, and Philip Hone, of New York.
Edwin Croswell, editor of the *Albany Argus.*
Jacob Hays, high constable of New York city.
John Meigs, high constable of Albany.
Erastus Corning, Lewis Benedict and John Townsend, hardware merchants.
Jesse Buel Jr., * of the engineer department, who was on the road from the first survey until it was in operation.
John I. Boyd, merchant.
William Bay, physician.
Simeon De Witt Bloodgood, counselor.
L. H. Tupper, * steam boat captain.
Thurlow Weed, * editor of *Evening Journal.* It is remarkable that no notice of these excursions, nor anything relating to the enterprise, is to be found in the files of the *Evening Journal.*
William B. Winne, the ancient penny post.

Of course others must have been present and joined in the excursion. It may be thought that I give importance to trivial matters in this connection. Erroneous dates and statements have been published concerning these events by persons writing from memory many years after they occurred. Happening as they did within my own memory, I have endeavored to corroborate my statements by cotemporary authorities.

It was intended that the English engine, which had been designated the Robert Fulton, should move an imposing train. But the old difficulty attributed to the feed pipe again interposed, and that machine was withdrawn, and the party, which had been delayed till twelve o'clock, was started off with a train of three cars drawn by the De Witt Clinton, and the others followed by horse power. A dinner was given to the party at Schenectady, whereat the

* Survivors in May, 1875.

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president of the road, Mr. Cambreling, gave the following memorable toast:

The Buffalo Rail Road — May we soon breakfast at Utica, dine at Rochester, and sup with our friends on Lake Erie.

It occupied seventy-two continuous hours of wearing travel by stage to reach Buffalo at this time.

The locomotive returned with five cars, making the trip in thirty-five minutes. It was now dubbed jocosely Brother Jonathan, and the English engine John Bull; although the true John Bull did not come on till the next year.

It is remarked that this trip removed the doubts of the gentlemen from New York, with regard to the practicability and utility of the Harlem enterprise.

Such was the increase of travel over the road, that while the daily average of passengers was 180 in August, in the month following it was 322.

The notice of an application to the legislature for a through road to Buffalo was soon after published, and a new medium for speculation arose, and grew in magnitude daily before the vision of capitalists.

In January, 1832, the company reported to the legislature, that the amount actually paid and disbursed in the construction of the road was $483,215; that by the estimates $156,693 would be required to complete it.

In the spring of 1832, the road was completed throughout its whole line, and the inclined planes being in working order, another grand excursion was given on the 14th of May, extending from the foot of Gansevoort street into the heart of Schenectady. The event was witnessed by a large assemblage, and attended by the firing of cannon. The cars were drawn up the inclined plane by means of a long rope attached to them, and to a stationary engine at the top, the whole steadied and balanced by a car loaded with stone descending on the opposite track. The same ceremony was observed at the Schenectady terminus, occupy-

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ing much time, and becoming somewhat tedious when the novelty wore away. The same style of rail road coaches was still used. In the fall of this year a new pattern of car was built in Schenectady, more nearly like those now in use, the *architecture* of which was modeled from Dr. Nott's parlor stove, and was called the gothic car. No shop was yet prepared to turn out these vehicles with dispatch. Mr. Jesse Buel has furnished me with a representation of the new car, the drawing made by himself in 1832.

In January 1833, the company having erected in State street for a hotel, the building now occupied by the Free Academy, the cars were run by horse power from State street to the junction, where they were coupled to the locomotive. The stock at this time was selling at $1.25, and matters were in a prosperous and satisfactory state with the directors, when an unexpected episode occurred to disturb the even tenor of their way.

At a meeting of the common council in July, the mayor, Francis Bloodgood, made a long speech concerning the tearing up the pavement of State street, for the purpose of laying a track to the river, and concluded by recommending the prosecution of the company for an unlawful proceeding. It resulted in the company being fined ten dollars, by Justice John O. Cole. It is understood that the charter of the company required them to lay down a track to the river. It was never used, although the company completed it this year, notwithstanding the common council sought to relieve them of this unnecessary expense by an enactment. But the stock was largely owned in New York, and it was found that the act of the legislature could not be annulled by the city board, and the directors were apprehensive that a failure to comply strictly with the terms of their charter, would reinvest the turnpike company with the rail road privileges, which they formerly claimed to hold.

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Aug. 5, 1833, a communication was presented to the common council in respect to the rail road entering the city through State street. It was submitted to a committee who reported that they thought the company might safely be allowed to approach the basin from Gansevoort street under proper restrictions.

1836. An effort was made before the common council to permit the laying of rails from Gansevoort street to Ferry street, to admit trains to reach the Greenbush ferry. The property holders held this project some time in abeyance, being opposed to the passage of trains through their streets. It was finally accomplished in 1839, and a depot improvised where the Taylor Brewery now stands.

The terminus at the head of State street was then abandoned, and the State street portion of the road having been indicted as a nuisance, the authorities proceeded to take up the track from the dock westward through State street to the junction with Lydius street, and horses were used only to draw the coaches to the foot of the inclined plane at Pearl street. Having fought a campaign with the city in laying the track down State street to fulfil the requirements of their charter, so greatly to their disadvantage, a new war arose when they proceeded to take up the track. A meeting of citizens was called by the Board of Trade to condemn the change of terminus and the abandonment of the depot at the head of State street. On the following day another meeting was held by another class of citizens, who deprecated the proceedings of the Board of Trade, and sanctioned the change made by the rail road company. The opposition, unable to change the action of the directors of the road, organized a line of stages to compete with them, and pitted horse power against the power of steam; and the last of the stagers, Joseph Webster, who had witnessed the entire decadence of a great enterprise, found himself quite suddenly reinstated in his old occupation. Active in this opposition was John L. Schoolcraft. A lively

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business sprang up again in staging. The old coaches that had been laid aside were hauled out and brushed up, and State street saw the revival of a business that was supposed to have passed away forever. On the 22d of September a hundred passengers had been sent over the turnpike before ten o'clock in the forenoon. The fare was fifty cents, and such was the energy of the opposition, and the eagerness to save twenty-five cents so great, that in seven days 1,697 passengers were carried over by the stages, twenty stage loads going over in one day without taking all passengers that offered. Nothing like this had been known to the turnpike in the palmiest days of that ancient thoroughfare. Steam finally triumphed however, and the strife ceased.

In November, 1841, a special meeting of the common council was called to deliberate upon a proposition of the directors of the rail road, offering to the city their State street property and $150,000 of the bonds of the company, if the city would undertake the expense of doing away with the inclined planes, at both ends of the road, and bring the eastern terminus as near the centre of the city as possible, locomotives to be used. The change was made, the shares which had declined to less than fifty cents on the dollar, again rose in the market and attained a respectable position among the stocks.

This may be as far as a *didactic discourse* on a pilgrimage to Schenectady in 1831, can with consistency be carried. A retrospect of the rude but novel appliances which we viewed with so much wonder and admiration less than half a century ago, will awaken for the moment by its contrast a more vivid realization of the progress of the age in which we have been placed. The simple and feeble locomotive with an imperfect feed pipe — the fragile tender, provided with two baskets of faggots and an armful of wood — the cramped coach bodies used as cars, having three inside seats capable of seating three persons

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each — the vehicles coupled by three links, and the train thought to attain terrific speed at twenty miles an hour — have been superseded by ponderous locomotives whirling immense trains through the country with a speed, at times of sixty miles an hour — the track elongated to New York in one direction, and to Buffalo in another — indeed it may be claimed from the Atlantic to the Pacific — this line alone having within the state of NewYork 1300 miles of steel rails, and 700 locomotives dragging with irresistible force 2,000 passenger and freight cars through twenty-five counties and seventy cities and incorporated villages —

"Whizzing through the mountains,
Rattling over ridges,
Shooting under arches,
Rumbling over bridges,
Singing through the forest,
Buzzing o'er the vale,
Bless us!" *how amazing!*
The wonders of the rail.

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The Black Spruce. By CHARLES H. PECK, A.M.

[Read before the Albany Institute, May 4, 1875.]

If we should consider merely the intrinsic beauty of the black spruce, its ornamental character and its botanical relations, we would not hesitate to bring it forward as an object worthy of the contemplation of the intelligent and the learned; but when we remember the important part it plays in the formation of our primeval forests, its great value to man, its applicability to building purposes and its utility in the arts, with much more confidence do we bespeak your indulgence while we briefly notice some of its general characters, its peculiarities, its variations and its enemies.

The common name "black spruce" has reference to the very dark green hue of the foliage. Botanically it is known as *Abies nigra.* It is neatly contrasted with *Abies alba*, the white spruce, a closely related tree whose foliage is tinged with a glaucous or silvery hue. Double spruce and single spruce are terms applied respectively to these two trees in some localities.

The home of the black spruce is in the northern and eastern parts of North America. It is said by Michaux to be found in its greatest abundance between the 44th and 53d degrees of north latitude, and the 55th and 75th degrees of west longitude. This would include the southern part of Labrador, the Rupert river region, the provinces of Quebec, Nova Scotia and New Brunswick, all of Maine and the northern part of New Hampshire, Vermont and New York. Its real range, however, is much greater than

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this, for it extends southward along the Alleghany mountains as far as North Carolina, westward to Wisconsin and northward to the 65th parallel, ceasing to grow but a few degrees this side of the Arctic circle. It delights in cold, hilly and mountainous regions, attaining its largest size and growing most abundantly on those moderate elevations, ridges or slopes where the soil has a ready drainage and at the same time retains considerable moisture by reason of its mossy, shaded surface and goodly percentage of dark vegetable mold or muck. No matter how rocky the soil, the tree still flourishes. It also grows freely in low swampy lands and about sphagnous marshes, but in such localities it is inferior in size and quality. In places where it abounds, says Michaux, it constitutes one-third part of the forest. The assertion in Wood's *Botany*, that "dark mountain forests are often wholly composed of it" is scarcely sustained by any of the forests of this state.

The principal tract of spruce now remaining in this state is in the Adirondack region, sometimes designated as the North woods. It occupies parts of the counties of Warren, Essex, Franklin, St. Lawrence, Lewis, Herkimer, Hamilton and Fulton. Small outlying tracts may yet remain in Oneida, Oswego, Jefferson, Clinton, Saratoga, Washington and Rensselaer, but they are unimportant and destined to speedy destruction. A small tract, now nearly exhausted, existed in the Catskill mountain region. The remains of it are still found in Greene, Ulster, Delaware and Sullivan counties.

The black spruce belongs to a group of plants named botanically Coniferæ or cone-bearing plants, a name derived from the conical shape which the fruit of some species assumes. It is structurally associated with some of the largest, most renowned and most useful trees of the world, for the giant Sequoias or redwoods of California, the famous cedar of Lebanon and the invaluable pines of the north temperate zone are all coniferous trees. The

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spruce as it occurs in the forest usually attains an altitude ranging from fifty to eighty feet and the basal diameter of the trunk is from one to two feet; but occasionally trees are found that have a diameter of nearly or quite three feet. The trunk is comparatively straight, very gradually tapering upwards and free from branches two-thirds to three-fourths the entire length of the tree. It is covered with a thin grayish-brown bark slightly roughened with small scales. This is not deemed valuable for tanning purposes, but it affords a very good covering for shanties and the log houses of backwoodsmen. The altitude of the tree increases by the annual growth of a single leading terminal shoot which in young and moderately vigorous trees advances about one foot in a season. This mode of growth is characteristic of all our pines and spruces. As this terminal shoot pushes its way upward it sends out annually from its base a whorl of branches. These branches are gradually shorter as we pass from the lower to the upper whorls, each successive one having one year's less growth than its immediate predecessor. They, therefore, as a whole, give to the tree a more or less regular conical outline. In process of time the lower branches decay and drop off, thus leaving a naked trunk. It is this peculiar mode of growth that makes these trees so available for ship masts and flag-staffs. The branches of the spruce are directed slightly upwards and are surrounded on all sides by the leaves. These are usually about half an inch long, somewhat four-angular and very narrow or needle-shaped. They remain on the branch about five years. The cones are pendent, ovate or oblong-ovate, three-fourths of an inch to an inch and a half in length and are somewhat variable in color, before maturity. The shape of the cone serves as a convenient character by which to distinguish the black spruce from the white, whose cones are narrow and almost cylindrical. The wood is light and strong and has considerable elasticity. It is of a brighter color than either the

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wood of the pine or the hemlock. Though decaying quite rapidly when exposed to the weather it is quite durable when protected. It constitutes an important element in the lumber trade. Spruce boards are deemed more valuable than hemlock but less valuable than pine boards because of a greater liability to warp and crack. They are harder than pine and are therefore more difficult to work. Spruce is sometimes used for the frames of buildings and for floor timbers, but generally it is cut into boards, door and window casings, siding, flooring, etc. In some localities the making of spruce shingles is an important branch of industry, but such shingles are generally considered inferior to those made from pine or hemlock. From the New York census returns for 1865, we learn that the amount of spruce lumber produced in the preceding year was 71,000,000 feet, more than six-sevenths of which was produced by the counties bordering on the northern forests. The value of this at twenty dollars a thousand would be nearly one and a half million dollars. The lumbermen of these northern counties go far back in the woods along the principal streams, cut the logs and draw them to the water courses. In the spring, when the water is high, they are floated down the stream to the mills where they are to be sawed. In this way deep inroads have been made in the forests so that they are not now the vast unbroken wilderness they seem. To one passing along the upper Hudson or the valley of the Sacandaga in summer time, the numerous piles of spruce logs that have lodged against rocks or on low banks, speak plainly of the rapid destruction of the spruces and of the swiftly contracting areas that are darkened by their shadows. And yet these are but the small portion of logs that fail to get through to their destination while the spring freshets last. If we suppose five thousand feet to be the product of one acre it would require more than 14,000 acres to furnish the 71,000,000 feet above mentioned.

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I come now to speak of a remarkable peculiarity of the spruce but one whose cause does not seem to be well ascertained. Singular as this peculiarity is I am not aware that it has ever been noticed or recorded by botanical writers. It seems proper, therefore, to speak of its existence though we may not at present be able to give a satisfactory explanation of its cause. In the vicinity of Rock river, in Hamilton county, many large spruces have been left standing on land cut over by lumbermen. Why were these trees left? An examination of the trees reveals the fact that they are affected by what lumbermen call *seams.* A chink or crack extends along the trunk following the course of the grain of the wood. If the grain is straight the seam also is straight, if the grain is oblique the seam winds obliquely around the trunk. They sometimes extend nearly the whole length of the trunk. They penetrate the wood deeply, often reaching nearly to the center, and they therefore detract much from the value of the tree for lumber. Such trees are consequently left standing when they grow far from the lumber market. If the tree is *cross-grained* the seam renders it worthless except for fuel. Externally these seams are bordered by a more or less abundant exudation of resin which in its dried or hardened state is popularly known as *spruce gum.* It is not improbable that the permanent character of the seam is due to the presence of the gum which prevents the healing of the injury. This gum is generally coated by a velvety stratum of black fungoid filaments, which give a blackish appearance to the seams.

Electricity and excessive cold have been suggested as possible or theoretical causes in the production of seams but neither is to my mind wholly satisfactory. When electricity rends the bark of a tree it carries the injury to the ground, losing itself in the earth, but the spruce seams generally cease before reaching the extreme base of the tree. Besides, a tree struck by the electric current seldom

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survives the shock, while seamy spruces live and thrive. Probably not more than one tree in fifty, on an average, is seamy. Why, then, should one tree be checked by excessive cold while forty-nine others in the same locality and exposed to the same temperature remain unharmed. It is barely possible that an unusually thrifty growth or an excessive surcharging of the tender tissues of the sapwood with moisture might give rise to conditions in which intense cold would produce a rupture but it is hardly probable. It would appear to be an easy matter to determine the cause of the seam by an investigation in its earliest stage or soon after its commencement, but I have never yet seen one in such a condition, and do not deem it worth while to waste time in speculating upon the cause of this curious feature.

Another character worthy of notice is the tendency of the leaves of the black spruce and its congeners to fall from the branch as soon as dry. It has always been a source of annoyance to the botanist that he cannot preserve a good specimen of a spruce branch in his herbarium. The leaves drop from the dried branches upon the slightest agitation. No matter whether the branch has been dried in a plant press or out of it, rapidly or slowly, the final result is a branch without leaves. I have tried in various ways to overcome this difficulty, but without full success. The nearest approach to success is made with specimens collected early in the season while the leaves of the new shoots are yet pale and tender. These young leaves adhere to the branches but the old ones drop off. This feature is not wholly peculiar to the spruce as it exists almost as markedly in the hemlock.

A complete knowledge of the black spruce requires an acquaintance with its varieties. Some plants are much more fixed and uniform in their characters than others. The spruce is much more disposed to be variable than the hemlock. Some varieties depend upon external conditions, cir-

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cumstances or influences which are easily detected, others seem to be constitutional or inherent in the plant itself. Their causes are not easily discernible. To one familiar with our evergreen forests the ideal or type of the spruce is that of a noble tree with a tall, straight, erect trunk supporting a somewhat conical head of dark green spray. But the tree varies greatly from this type according to its age, the character of the soil and the altitude of its station. In young trees growing in open places or on cleared lands it is common to find the entire trunk occupied by branches, the lowest whorl being but slightly raised above the surface of the earth. This differs from the young trees of dense woods only in retaining its lower branches for a longer time. In open sphagnous marshes a form occurs so marked in its appearance that in some localities it has received the name of *bastard spruce.*

The branches, which frequently occupy the whole trunk, are generally very slender, the internodes short and the leaves pale. The tree has a feeble, starved or sickly aspect and does not attain a large size. A cross section of the trunk shows the concentric rings which mark the annual growth of the wood lying close together, which, with the short internodes of the branches, indicates a very slow growth. These trees are too small to be of any value. They are rarely fertile.

In wooded swamps and low lands a larger form is common. It scarcely differs from the ordinary forest tree except in its inferior size and quality. It affords a poor quality of wood and is sometimes cut into piles to be used in the construction of dykes and the foundations of bridges and large buildings. It is not worth much for lumber. It is intermediate between the bastard spruce and the forest spruce having the distinct trunk of the latter and the starved, unthrifty look of the former.

Another form occurs in the Adirondack region and is

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said to grow also in New England. It has a silvery or glaucous hue to the foliage on which account it is sometimes mistaken for the white spruce. Its cones, however, have the shape of ordinary black-spruce cones and enable us to correct a very natural mistake. The cause of this variation is not easily perceived unless it is the result of cross fertilization between the black and the white spruce. The two preceding forms manifestly depend upon the character of the soil.

A large form with cones of unusual size and wood of soft texture was once described as a distinct species. It received the name *Abies rubra* or red spruce, but it is now deemed only a variety of the black spruce. Its range is northward. According to Michaux, in Nova Scotia its wood is used in making fish barrels on account of the ease with which it is worked.

But the most remarkable variety is found on the highest summits of the Adirondacks. Remarkable as it is I have seen no description nor even mention of it in our botanies. It is the variation of the tree into a mere procumbent shrub, so small that it offers but little impediment to him who would walk over it. These bushes are more or less flattened in outline, the branches issuing mainly from the two opposite sides of the trunk as in the ground hemlock. They grow in dense patches completely covering the ground, and in numerous instances with their apices all pointing the same way. They have the short internodes and the short pale leaves of the bastard or sphagnous marsh variety. Sometimes the leaves are tinged with a glaucous hue as in the variety previously mentioned. I have never seen cones on this dwarf form nor is it probable that it ever produces them. Its stunted form speaks plainly of the struggle of a hardy plant for existence in unfavorable conditions. A thin soil, the prevailing low temperature of high altitudes, fierce blasts of winds and the crushing weight of heavy snows all conspire to keep down anything

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like successful tree growth on the tops of these mountains. The two extremes of the black spruce have now been noticed. The one a noble forest tree fifty to eighty feet high with a well formed trunk one to two feet in diameter at the base, supporting a symmetrical top or head of branches covered with dark green leaves, the other a dwarf of the mountain top scarcely a foot high, with no distinct trunk and without strength to maintain an erect position, its stunted branches spreading two ways and bearing short, yellowish-green leaves, the whole looking very much as if it were a feeble branchlet of the former thrust obliquely in the ground. What thoughts do they suggest concerning the variability of the species, what concerning its stability. Surely a remarkable degree of variation, a singular tenacity of life, a wonderful power of adaptation to altered conditions is manifest. The spruce shows itself capable of maintaining an existence under most adverse circumstances. It grows where very few other trees can grow. But at the same time it shows that there is a limit to its variability, and that there are bounds to its powers of adaptation beyond which it cannot pass. The stately forest spruce can not stand on the summit of Mt. Marcy but its wonderfully diminutive descendant may maintain a feeble individual existence there. I say individual existence for this dwarf does not appear to be capable of propagating itself by seed. And herein appear the limits of its variability. When the reproductive power fails the utmost degradation and variation of the species seems to be reached for it can then only maintain an individual existence. This power is the great conservator by which the integrity of species is preserved; it is the dead line beyond which if they go destruction awaits them. Nature seldom fails to brand with sterility excessive departures from her normal forms, no matter whence these departures come, whether from starvation or stimulation, self-fertilization, or hybridization.

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Let us pass now to the consideration of the parasites of the spruce. Perhaps no species of flowering plant is wholly free from the attacks of animal or vegetable parasites, but some are much more liable to these attacks than others. One species may be subject to the attack of a single parasite, another, of a half dozen or more. I have sometimes thought that the greater the susceptibility of a plant to variation the greater its liability to parasitic attacks. Certainly the variable black spruce is obnoxious to many parasitic foes.

Arceuthobium pusillum, a brief account of which was formerly read before the Institute, is one of these. Like many other parasitic plants it is destitute of true leaves. Botanically it is related to the mistletoe and by way of distinction it might be called the spruce mistletoe since it is thus far peculiar to that tree. It often occurs in abundance fringing the younger internodes of the living branches by the multitude of the plants. Having once attacked a tree it continues to prey upon it year after year, growing with its growth and thriving with its thrift. The remarkable fact about it is that thus far it has been detected on those s[illegible] ruces only which grow in swamps or on and around sphagnous marshes. It has not yet been seen on the typical forest spruce. Though this plant was first discovered but little more than three years ago it is now known to occur in five counties of the state. I have not heard of its discovery beyond the state boundaries. It is not positively known to kill the tree it attacks but it is probable that it sometimes does. Dead trees occur which bear the marks of its former presence.

Peridermium decolorans is another foe to the spruce. It is a species of fungus allied somewhat to the rust of the grain fields, but more closely to the cluster cup fungus. It consists of small scattered tubercles which burst forth from the leaves of the spruce, rupture at the apex and reveal a mass of yellow, dust-like spores within. The affected leaves become yellow and probably drop from the branch

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at the close of the season. This fungus is but little known. I have observed it myself in the Adirondack region during a single collecting trip only, and have received specimens from Essex county in this state and from the White mountains of New Hampshire. It was abundant on the starved spruces about Boreas-pond and on the summits of Mts. Colvin, Nipple Top, Haystack, Skylight and Marcy. In some instances nearly if not fully half the leaves on a tree were affected. The foliage therefore had an unnatural hue even when seen at a distance. It would be interesting to know if the fungus was exceptionally abundant that particular season and also if its attacks are ever sufficiently severe to cause the death of the tree. They certainly can not be otherwise than injurious, but other conclusions must await further observations. It is noticeable that this fungus, like the Arceuthobium, does not appear to attack the forest spruce. Both prey upon the degenerated feeble forms of the species, thus showing a certain kind of respect for the great and noble trees of the forest and giving a wider application than is usual to the old maxim "kick the man who is down." It is perhaps one of nature's methods of indicating her displeasure in degraded varieties and one of the means by which she seeks to preserve the integrity of her species.

Among the animal parasites of the spruce we find a small plant louse that attacks the tips of the branches early in the season. It causes such a transformation of the leaves at the end of the branch as to produce the appearance of green cones. The leaves become flattened and excessively wide and overlap each other like the cone scales. The elongation of the branch is checked and the general resemblance of the mass to a cone is so close that any but close observers would be likely to be deceived by it. Doubtless it is this insect to which Dr. Packard refers when he says "a species closely related to the European *Adelges coccineus* of Ratzburg and the *A. strobilius* of Kaltenbach,

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which have similar habits, we have found in abundance on the spruce in Maine, where it produces swellings at the end of the twigs, resembling in size and form the cones of the same tree." I have seen it but once and then on a single tree so that it is not probable that any considerable injury is wrought by it to the spruces in our state.

Another more common but somewhat similar affection I have observed in many localities. It is most abundant on young trees growing in open places. The tips of the affected branches are covered by crowded, incurved dead leaves. At a distance they might be mistaken for the mature cones of the tree. A close examination shows that there is a kind of gall or swelling at the base of each leaf, the little brown scale upon which the leaf stands being irregularly enlarged and excavated on one side. Common as are these affected branchlets I have never seen the insect that does the mischief. From the character of the injury it is almost certain that it is produced by some minute plant louse or gall making insect which inhabits the concavity and appropriates to itself the juices that should go to nourish and sustain the leaf. Usually the growth of the affected twig is stopped, but sometimes the branch is prolonged beyond the injury. Although the tree is injured I am not sure that it is ever killed by the attacks of this parasite. The third insect foe is one much more to be dreaded and one before whose ravages all other injuries dwarf into insignificance. If we except the destruction caused by man himself probably all other agencies combined do not destroy as many spruces as the one which we shall presently bring to your notice. I quote the whole account of it from my annual report recently made to the Board of Regents of the University.

In my last report allusion was made to the fact that the spruce trees in some parts of the great northern wilderness were said to be dying at an unusual rate as if affected by some fatal disease. In the absence of any per-

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sonal knowledge of the circumstances or conditions attending the destruction of these trees, the attacks of fungi, the attacks of insects and the effects of drought were suggested as possible causes, chiefly for the purpose of directing the attention of those who might have the opportunity of an investigation, in such directions as seemed most likely to afford a satisfactory explanation of the mystery. It was then my impression that the trouble was of comparatively recent date, and that it was possibly due to the modification of our climate by reason of the extensive and rapid denudation of our forest lands. But I find that it is no new thing, that years ago lumbermen were fully aware of the pecuniary loss they were sustaining from this timber malady. Mr. Henry Hough, in answer to my inquiries, writes from Lewis county thus: "The dying of the spruce in this section has mostly if not entirely ceased. The greatest destruction in our territory was from ten to fifteen years ago." In Rensselaer county the same trouble was experienced about thirty years ago. A lumber firm found that their spruce timber was rapidly dying and to make their loss as light as possible they made haste to open roads in the forest that they might draw out and work up as many dead spruces as practicable before decay should render them entirely worthless. But with all their promptness they suffered no inconsiderable loss, for these dead trees soon become too much decayed to make marketable lumber.

I have asked lumbermen and others who have been aware of the destruction of the spruces, what theory they held in respect to the cause of it. Their theories are various but the most prevalent attribute it to excessive dry weather or to the agitation of the trees by high winds. The few observations that I have been able to make lead me to adopt a theory quite different from these, and though the discussion of it belongs rather to the province of the entomologists than of the botanists, such is the importance

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of the subject that I can not withhold a brief account of my investigations and conclusions.

In August a collecting trip was undertaken in the vicinity of Lake Pleasant, Hamilton county. While there it became apparent to me that I was in a region where the spruces were dying. Standing near the outlet of the lake and looking upon the distant mountain slopes toward the northeast, east and south, patches of brown appeared here and there mingled with the usual dark green hue of the forest. The inhabitants told me that these brown patches were groups of dead spruces, that the spruce trees were then rapidly dying and had been for two or three years previous and that in consequence the value of the woodland was greatly diminishing. One of the most conspicuous of these brown patches was on the slope of Speculator mountain, a little more than half way from the base to the summit. Preparations were therefore made to visit this locality. Once on the ground it needed but little observation to satisfy me that the destructive process was then in operation. The ground under some of the spruces was thickly strewn with their fallen leaves, yet green, and every agitating wind was bringing down more of them. The bark of these trees and of others already dead was perforated in many places with small round holes scarcely one-eighth of an inch in diameter. Upon stripping a piece of bark from the trunk of one of the affected trees the apparent cause of the mischief was at once revealed. The surface of the wood and the inner layers of the bark were abundantly furrowed by the winding and branching galleries of a small bark-mining beetle, an insect known to entomologists as the *Hylurgus rufipennis* Kirby, though the wings are by no means always red as the name would indicate. Both the mature insect and its larvæ occurred in countless numbers under the bark of the dying and recently dead trees. In a single instance they were accompanied by a much smaller beetle of similar shape and

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habits, the *Apate rufipennis* Kirby,[1] but the former is evidently the chief agent in this unprofitable business. These insects excavate their passages between the bark and the wood, eating away a part of both. Their extended work is therefore equivalent to a girdling of the tree. Their numerous galleries form an intricate network of furrows on all sides of the trunk, and traverse one of the most vital parts of the tree, the newly formed and forming layers of wood and bark. The furrows are shallow on the surface of the wood, rather more than half their diameter being in the bark, but their effect is to interrupt the circulation of the nutrient juices and finally to destroy all vital action. The perforations in the bark, by admitting moisture, doubtless work more or less injury. The surface of the sap-wood and the corresponding inner surface of the bark of living trees are discolored for a short space on both sides of the furrows, as if the injury exerted a poisonous or deadening influence on the tissues in its immediate vicinity. This was clearly seen in a tree which had been but slightly injured, there being but few furrows and these merely longitudinal ones without lateral branches. Each occupied the center of a discolored stripe about half an inch broad, but which usually extended from two to four inches up and down beyond the extremities of the furrows. In another tree there were groups of furrows separated by considerable intervals, the central portions of which intervals had a whitish, fresh appearance when the bark was first peeled, but after a few moments of exposure to the air the whole surface of the wood had changed to a dull, dead, brown color, indicating a diseased or unnatural condition of the surface tissues. The foliage on this tree had not yet lost the green hue of life but had commenced falling to the ground.

[1] I am indebted to *Messrs. J. A. Lintner* and *J. L. Leconte* for the entomological names of these insects.

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Small trees are rarely attacked. In the localities visited, from one-half to two-thirds of the spruces with a basal diameter ranging from one to two feet were either dead or dying. Trees of this size are the most suitable for lumber and consequently the most valuable. The smallest affected tree noticed had an estimated basal diameter of about ten inches. In this case the attack appeared to be a failure, for so much resin had oozed from the wounds that the work was obstructed. The galleries were scattered and single and their authors were found dead, each in its furrow. No larvæ were present and the apparent attempt to establish a colony in this tree had thus far failed. But it may be that this tree had only been attacked for the purpose of obtaining food and had not yet been brought into that sickly, languishing condition thought by some entomologists to be necessary to induce the establishment of a colony, the deposition of eggs and the development of larvæ. For it is said of the *Scolytus destructor*, a bark-mining beetle that sometimes proves very destructive to elm trees in Europe, that the adult insects first attack healthy trees for the purpose of obtaining food and when by this means the vigor of the tree has become somewhat impaired the female deposits her eggs in her galleries. Then the rapidly increasing numbers soon destroy the life of the tree.

When two trees of unequal size stand in close proximity the larger one seems to be most liable to be attacked. In one instance two trees stood scarcely more than three feet apart. The larger one had been attacked, the smaller remained unharmed. In another similar instance the larger of the two trees was dead, having been attacked first, the other was dying. Why this preference on the part of these insects for the largest trees? It may be that young trees are apt to be too resinous to be attacked successfully. In the case of the small tree already mentioned the gummy exudations from the perforations in the bark first attracted my attention. Or the insects may instinctively know that a tree

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with a large trunk presents a broader field for their operations than one with a small trunk; or possibly the vigor of the tree may be so impaired by age that it is more readily brought into suitable condition for the habitation of these parasites. Whatever the cause of this selection, no diseased condition of the trees was detected except that which was accompanied by and to all appearance was directly due to the insects themselves. Certainly if the tree is at all diseased before its attack the insects must be exceedingly quick to detect it, else they could not be found in abundance in trees whose leaves are yet green and whose sapwood is yet fresh and moist except where stained by their excavations.

In the vicinity of Lake Pleasant the affected trees are upon the mountain slopes or on dry ridges where the spruces are especially abundant. And we might naturally expect that the insects would be attracted to and carry on their depredations most extensively in those localities where the material on which they work is most abundant. In the valleys I saw no trees affected by them and yet they doubtless do carry on their destructive work in the low lands where spruces abound. I see no reason why they should not.

In some localities their ravages have already ceased. On the slopes of an elevation a few miles southwest from Speculator mountain there are two groves of dead spruces. Many trees in both were examined, and, though all the dead ones bore unmistakable marks of the former presence of the beetle, not one could now be found either in the adult or in the larval state. What had caused them to disappear? Surely not the lack of material on which to work, for several large living spruces yet remained. This leads to the consideration of remedies. Doubtless there are natural agencies whose free operation has a tendency to check the ravages of these insects and to prevent their excessive multiplication, but there are times and localities

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in which these opposing agencies are inefficient or inoperative and then these destructive insects multiply rapidly and their ravages become painfully apparent. It is then necessary that man himself should do something to protect his property from these active little foes. It was noticeable that many of the dead trees in the two groves just mentioned had their bark so chipped by woodpeckers that the general hue of the trunk was a reddish brown instead of the usual grayish brown. Here then is a possible explanation of the cessation of the ravages and the absence of the insects. Here is doubtless the indication of one of nature's antidotes to the mischief. The woodpecker is the natural foe of such insects. With its long beak and barbed tongue it extracts them as a dainty morsel from beneath the bark. It is quite probable that these birds had congregated in these two localities in sufficient numbers to completely stop the ravages of the insects. A few were seen at work on the affected spruces of Speculator mountain, and if not interrupted they will probably in due time succeed in checking the ravages there also. The protection of these birds is to be enumerated among the means to be employed in checking the malady of the spruces. They are the friends of the forest and the allies of man. How insignificant the insect yet how capable of injury. How lightly we esteem the woodpecker yet how indispensable are his services.

A remedy employed in similar cases in Europe is to cut down the affected trees, strip off their bark and burn it with its destructive tenants. Though it is somewhat doubtful if the owners of large tracts of timber land can be induced to adopt this method of checking the destruction of their spruces, it is certainly to be recommended. The loss from its omission would soon far exceed the cost of its employment, but care should be taken not to engage in this work in a dry time lest the destruction from forest fires should be greater than that from insects.

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A brief extract from the Entomology of Kirby and Spence will show that the ravages of insects upon forest trees in Europe have sometimes been serious, and that it is none too soon for us to note well what is transpiring in our own forests.

"The bark-borer of the oak is a small beetle of an allied genus, *Scolytus pygmæus*, which with us does no great harm, but so abounded of late years in the Bois-de-Vincennes near Paris that 40,000 trees were killed by it; and many of the finest elms in St. James' Park and Kensington Gardens as well as in the promenades of various cities in the north of France, have fallen victims to another of this tribe, *Scolytus destructor*, whose trivial name well characterizes the frequency and severity of its ravages. The ravages of *Tomicus typographus* in the pine forests of Germany have long been known under the name *Wurmtrokniss* (decay caused by worms), and they sometimes attack the inner bark in such numbers, 80,000 being sometimes found in a single tree, that they are infinitely more noxious than those insects that bore into the wood. About the year 1668 this pest was particularly prevalent and caused incalculable mischief and in 1783 it is estimated that a million and a half of trees were destroyed by it in the Hartz forests alone. At this period, when arrived at their perfect state, they migrated in swarms like bees into Suabia and Franconia. At length between 1784 and 1789 in consequence of a succession of cold moist seasons the numbers of this scourge were sensibly diminished, but they appeared again in 1790 and so late as 1796 there was great reason to fear for the few fir trees that were left." Westwood states that occasionally the evil was so great that prayers were offered in the churches against its extension. While we hope that our spruce-tree bark-borer may never prove to be such a pest as this Tomicus we certainly think that he deserves some special attention.

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INDEX.

Ætrypa reticularis, 208.
Adirondack boats, 262–264.
Adirondack spruce, 290.
Agaricus, number of species in New York, 163.
Agaricus muscarius, 163.
Agassiz, L., on evolution, 212.
Albany water supply, a paper by P. Hogan, 167–178.
Alchemy of happiness of Ghazzali, translation of, by H. A. Homes, 38–147.
Allegories of Ghazzali, 120, 122, 124,
Alphabets, changes in form, 188.
Ampersand pond, 264.
Andréossi, Gèn., quoted, 7, 14.
Andromeda ligustrina, 160.
Annapolis, Md., 31.
Anthropology, *etc.*, report on, by W. H. Hale, 183.
Aqueducts of Constantinople, 3–6: of Rome, 171.
Archæopteryx, 209.
Aritsotle's philosophy, 223.
Azalea nudiflora, 159.

Bader, Battle of, 112.
Baltimore, Lord, 20.
Barnes, W., 178.
Baths of Constantinople, 15.
Belgrade, forest of, 2.
Bendts, 3.
Berkeley's North American *fungi*, 155.
Bingham, Mr., 178.
Black Spruce, a paper by C. H. Peck, 283.
Black Spruce, natural history of, 285; seams in, 287; bastard spruce, 289; Adirondack spruce, 290; enemies of, 292, 293, 296, 298; decrease of, 295; destruction by wood peckers, 300; remedies against its enemies, 300; ravages upon it in Europe., 301.
Bloodgood, F., 279.
Boats, portable, a paper by V. Colvin, 254; history of boats, 255; Fremont's boats, 262; Kane's boats, 262; of paper, 263.
Boisduval, Dr., 217, 219.
Boomerangs, 186.
Botany, progress of, a paper by C. H. Peck, 152–166; dimorphism, 164.
Brown, W. H., 275.
Buel, Jesse, 279.
Burr, Aaron, 24.
Butterflies in Mr. Meske's collection 215.

Calculus of Operations, a paper by John Paterson, 190.
California redwoods, 156.
Callaway, C., a paper on the geological evidence of the origin of species by evolution, 207–214.
Canada thistles, 153.
Canoes, 259, 260, 261.
Carex genus, 163.
Carpenter, Dr., 243.
Catoclas, 219.
Causality, thoughts on, a paper by Dr. A. Winchell, 231–253.

Digitized by Google

Causality, summary of principles, 251, 252.
Causation, secondary, 251.
Cause, defined, 233, 234, 236, 240.
Chace, J. T., 21.
Chance, 231, 232.
Cisterns of Constantinople, 8, 9, 11.
Citizenship, 35.
Clytocibe agaricus, 158, 159.
Colvin, V., paper on Portable boats, 254, 178.
Constantine, emperor, 2.
Constantinople, water supply of, 1–18.
Constitutions, written, 35.
Convection thermoscope, 181.
Cooley, L. C., a paper on a new form of rotator, 179, 180; paper on the detection of heat by convection, 181, 182; 178.
Coracles, 256, 257.
Cryptogamic botany, 155.

Darwinism, 225, 242.
Deinosauria, 209.
Democritus' views, 223, 224.
Dervishes, 149.
Dimorphism, 164.
Duane, W. J., 27.

Eclipses explained, 150.
Edwards, Isaac, a paper on the character of Chief Justice Taney 19.
Egyptian races, 186.
Electricity, 250.
Emanation or repulsion, 197.
Emerson, Dr., 31.
Engines, first locomotive, 273, 277.
Essence, philosophical, 150.
Eternity, 133.
Ethnlogy, etc., a report on, by W. H. Hale, 183.
Evans, O., experiments of, 268.
Evolution, a paper on the geological evidence of the origin of species by evolution, by C. Callaway, 207–216.
Evolution, in Dr. Winchell's essay on causality, 222–226.

Featherstonhaugh, G. W., 268, 270, 271.
Fertilization of plants, 161.
Fischer-von Waldheim, on the Biology and history of the Ustilagineæ, 154.
Force, 248, 249.
Forests, protection of, 13.
Fountains, 10.
Fox, Col., 186.
Fungi, study of, 161; number of species, 162; extract from Fries, 163; fungi of North Carolina, 162; fungi of the U. S., 162; elementary manuals, 165; preservation of, 165; inimical to the spruce, 292.

Gage, Gen., 202, 205.
Genosomania, 217.
Geography of the tertiary period, 213.
Geological evolution, 209–214.
Ghazzali's Alchemy of happiness translation, 38–147; his character, 38, 42, 149.
God, love of, portrayed by Ghazzali, 135; signs of love, 145–147.
Gould, J., 276.
Gray, A., 156, 157.
Gruber, M., Taney's defense of, 24.

Haeckel's writings, 221.
Hale, W. H., Report on progress of Philology, Ethnology, etc., 183.
Harte, Bret, 185.
Hasenclever, Peter, a notice of his life, by H. A. Homes, 199; land patents of, 204, 205.
Hasenclever's mine, 201.
Hasenclever steel, 206.
Hawkesbury Upton, England, wells at, 169.

Digitized by Google

Hayden's geological expeditions, 157.
Heat, a paper on the detection of heat by convection, by Prof. L C. Cooley, 181.
Heat, operation of, 192, 193, 197, 247.
Hell, Mohammedan, 115–121.
Herbarium of New York state, 157.
Hessian fly, 153.
Hogan, P., a paper on the water supply of Albany, 167–178.
Homes, H. A., a paper on the water supply of Constantinople, 1–18; notice of life of P. Hasenclever, 199–206; preface to his translation of Ghazzali's Alchemy of happiness, 38–43.
Horse (*Hipparion*, *Plagiolophus*), 211.

Instincts, 242.
Iron, manufactured in 1764 in N. Y., and N. J., 199; Hasenclever's iron manufactures, 203–206.

Japan, Japanese, 184.
Johnson, Sir W., 202.
Judicial bias, 34.

Kayaks (boats), 258.
Kent, Gov., of Md., 27.
Key, Anna P. C., 23.
Khalfa, Hajji, extract from his Jihani Numa, 150, 151.
Koran, treatment of the, 133; principles of interpretation of, 150.

Lake Pleasant, N. Y., spruces of, 296, 299.
Language, 184.
Law in philosophy, 238.
Lepidoptera, a paper on Mr. O. Meske's collection of, by J. A. Lintner, 215–220; descriptions, 216, 217.
Lepista of Smith, 159.
Lewes, G. H., opinions on Ghazzali, 39.
Lichens, 152.
Life, 250; origin of, 196.
Lintner, J. A., a paper on Mr. Meske's collection of *lepidoptera*, 215–220.
Livingston, R., iron manufacturer, 201.
London, proposed supply of water, 171, 172.
Love of God, signs of, 145–147.
Lucretius' philosophy, 223.

McAlpine, W. J., survey for water for Albany, 174, 177.
Man, unity of race, 185, 188, 189.
Marsh, G. P., extract from his Man and Nature, 13.
Marshall, John, 28.
Materialism, 228.
Matter, 224.
May apples, 160.
Megatherium, 212.
Meske, O., his collection of Lepidoptera, 215; his enthusiasm, 218.
Mining companies in the colonies, 32, 33.
Miracles, 57, 58.
Missouri compromise, 32, 33.
Mohammed, the preserved table of, 148; the calendar, 149.
Mohawk and Hudson river rail road, its history, a paper by Joel Munsell, 267; arguments for, 269; list of first passengers, 276; development of, 280; capital of, 281.
Montague, Lady Mary, 2.
Munsell, J., paper on the History of the Mohawk and Hudson river rail road, 267–282.
Mycology, hindrances to the study of, 168.
Mystics, Mohammedan, 40, 61, 63, 148.

Digitized by Google

Nebular hypothesis, 223.
Nesbit, Dr., 20.
Nescience school, 229.
New Jersey iron mines, 199.
New York state herbarium, 157, 158.
Nushirwan emperor, 138.

Old Arm-chair, a trial regarding the song, 29.

Paper boats, 263.
Paterson, John, a paper, supplementary to his calculus of operations, 191.
Patroon's creek, 176, 177.
Paxillus, of Fries, 159.
Peck, C. H., Report on the progress of Botany, 152–166; a paper on the black spruce, 283–301.
Philology, a report on the progress of, by W. H. Hale, 183.
Philosophy, inductive, deductive and positive, 237.
Physiology of Ghazzali, 67, 74, 106.
Predestination of the Mohammedans, 148.
Premiums in agriculture in 1764, 202.

Quetelet, statistics by, 188.

Rail roads, Mohawk & Hudson, 267; first train on, 266.
Reed, Mr., and the Old Arm-chair, 29.
Rivington, J., letter from, 204.
Robert college, Constantinople, 12.
Rome, Italy, water supply of, 171.
Rotator, a new form of, a paper by L. C. Cooley, 179.

Sale, G., opinion of Ghazzali, 40.
Sanford, J. F. A., 31.
Schuyler, Col. J., 203.
Science, 231.
Scolytus pygmæus, 301.
Scott, Dred, case of, 31.
Silver mine in New York, 206.
Slavery in the court of the United States, 33.
Slaves of Judge Taney, 23.
Social Science statistics, 188, 189.
Soofees, *see* Mystics.
Sorcery, 59.
Soul, knowledge of the, 43, 53.
Space, 191.
Species, what is, 207, 208.
Spencer, Herbert, 225, 226, 229, 242.
Speyer, Dr., and Mr. Meske, 218.
Sphinges, 219.
Spirifera disjuncta, 208.
Spirit, 106, 108.
Spirits, classes of in the future world, 111, 112.
Spruce, Black, a paper by C. H. Peck, 283–301.
Stevens, Mr., of New Jersey, 268.
Stirling iron mine, 201.
Sun, The, 194.
Sweet, S. H., water survey of Albany 174.

Taney, R. B., chief justice, a paper on his life and character, by I. Edwards, 19–37.
Tertiary fossils, 212.
Thames river water, 170.
Thermopile, 182.
Thermoscope, 181.
Tholuck, Dr., on Ghazzali, 40.
Time, relations of, 191.
Torment of the mind in the future world, 118, 119.
Torrey botanical club, 155.
Townsend, Gen. F., 201.
Townsend, P., 201.
Traditions, value of, 151.
Tuckerman's North American lichens, 154.

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Tyndall, Prof., examination of his views by Dr. Winchell, 222, 224, 227, 238, 241, 247.
Typhoid fevers, origin of, 168; deaths from in England, 170.

Ustilagineæ, 154.

Valens' aqueduct, 5.
Van Buren, M., 27.
Van Rensselaer, Stephen, 271, 272.
Vorstellungskraft, 237, 238.

Water Supply of Albany, a paper by P. Hogan, 167–178.
Water Supply of Constantinople, a paper by H. A. Homes, 1–18.
Watson, W.C., 206.
Wells, polluted, 169.
Whitney, A., 276.
Whitney, W. D., 184.
Winchell, Alexander, a paper entitled Thoughts on Causality, 211–253.
Woodpecker and the black spruce, 300.
World, knowledge of, 96; knowledge of the future, 105.

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